Flow

THE UNIVERSITY OF TEXAS
1946
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THE MAGAZINE WHICH INTEGRATES MATERIAL HANDLING EQUIPMENT INTO THE FLOW OF PRODUCTIO

FEBRUARY
1946

IN THIS ISSUE:

Beginning to End . . . Keeping Equipment on the Go . . . Fill 'Em Up
The Man Who Makes Them . . . Well Founded Practices . . . In Good Form

Both depend upon

THE JOB OF MANAGEMENT

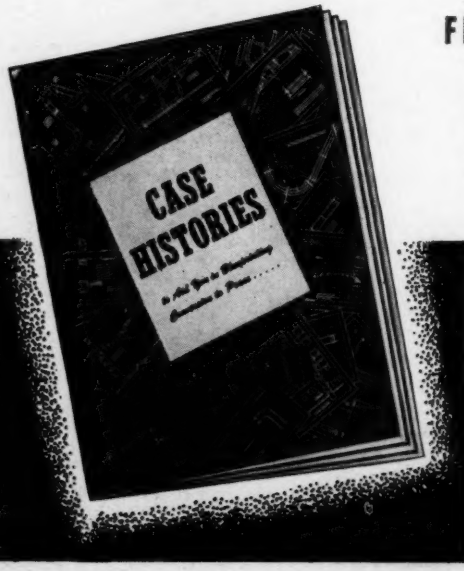
in Reconversion . . .

✓ Today—management faces its crisis! Upon the speed and the wisdom with which its plans for reconversion are set into motion depend both payroll and dividend. Only the efficient can survive!

Complete mechanization, enabling the most productive use of manpower, is of primary importance. Equipment that will do it better, faster, and cheaper is the best insurance for the future.

Lamson Conveyors and Lamson Pneumatic Tubes—engineered installations of these two cost-cutters helped win many an "E" award. The same plants will have a head-start in the race for the consumer dollar—the race that has already started!

To Assist You In Your Planning, We'd Like To Send the FREE BOOK "CASE HISTORIES



to Aid You in Blueprinting Conversion to Peace . . ." Come inside some of America's greatest industries with us — and see how they will handle the problems of increased output at lower cost. Ask for your copy TODAY!

LAMSON CORPORATION
1300 Lamson St., Syracuse 1, N. Y.

Please send my copy of your reconversion booklet. I'm willing to learn what your planning assistance has done for others.

Name..... Position.....

Company.....

Address.....

City and Zone..... State.....

Saves its Cost

OPERATED, TRAVELED AND STEERED FROM THE CRANEMAN'S SEAT

Air-Controlled

Without fatigue, and all day long, *one man,* with an Aero-Crane, does the work of 4 or 5 men—gets your material onto the stock-pile and off again at minimum cost. One man handles those 200 to 1000 lb. loads that otherwise eat up the time of a crew!

Designed for rapid yard work, the Aero-Crane goes anywhere a truck can go. You can travel it light or loaded with boom in any position. Your craneman needs no helper to steer or operate. Tough-built, with anti-friction bearings throughout, electric welded construction, non-burn clutches, air-controls, Aero-Crane keeps going free of breakdowns—pays for itself in saved man-hours alone!

Built in a range of seven models. Capacities of 3,500 to 50,000 lbs. at 12 foot radius. Diesel or gasoline powered.

- AUTO-TRUCK MOBILITY
- ANTI-FRICTION BEARINGS
- AIR-OPERATED CLUTCHES
- SAFETY HOIST BRAKES
- BALANCED WEIGHT RATIO
- SIMPLE POWERFUL DESIGN
- RANGE OF SEVEN MODELS

SEND FOR CATALOG No. 73

SENSITIZED

ORTON CRANE & SHOVEL CO.

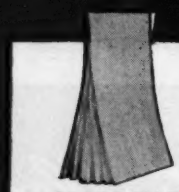
608 S. DEARBORN ST. CHICAGO 5 ILL

DO YOU GET *Full Shift* BATTERY POWER

Gould Kathanode power speeds your electric truck operation throughout each working shift. There are no slow-downs due to failing battery current. No working time is lost in trips to charging room for battery changes.

In the Gould Kathanode battery *layered spun glass* mats are placed on both sides of each positive plate. After a few months of service these are actually a part of the plate itself, holding *all* useful active material in place. Thus the ability of Kathanode to deliver useful current is maintained for its entire service life.

With Gould power you get the full benefits of electric truck operation. Write Dept. 102 for Catalog 100 on Gould Kathanode Glassklad Batteries for Industrial Truck and Tractor Service.



GLASS MAT

The extra protection of *layered spun-glass* is an original Gould development

WHY shuttle several costly units from platform to platform when you can

move the whole platform!

One tractor with one driver can keep several platform trailers busy.

Load and unload by running your electric trucks right onto the trailer. Tractor is released for other work while the trailer is being loaded.

Pick up the ready trailer and move it to any part of your plant—from building to building, or from loading to shipping platform.

If you have an extensive intra-plant materials handling problem you can reduce costs and increase efficiency with EASTON off-the-highway platform trailers. The trailer illustrated is the EASTON Model TP-15 built to your standard platform height with 180 sq. ft. of loading area, and a capacity of 30,000 lbs. Other sizes and capacities are available. Write for information: Engineering Counsel, Easton Car & Construction Co., Easton, Pa.

EASTON

TRAILERS · TRUCK BODIES
CARS · ELECTRIC TRUCKS

ENGINEERED

A-1010

To FLOW:
Wants to Save Articles

I would appreciate (the indicated) copies of free literature.

For your information, your publication is passed around the installation to our supervisors in the storage division. They appreciate the ideas they obtain from reading the many interesting articles. If you intend that the coupons be used for obtaining the free literature, we would appreciate it if they could be placed in a position in the publication that would not ruin an interesting article by their removal. Thanks!—Wm. A. Grenfell, Administrative Officer, ASF, San Francisco Medical Depot, San Francisco, Calif.

Reader Grenfell's thoughtfulness is appreciated. Later, we may be able to remedy the situation by inserting into FLOW a separate card for free literature requests.—Ed.

To FLOW:
Correction

We want to thank you for the publicity given our Association on page 24 of the November issue of FLOW magazine.

In the item there is a minor discrepancy to which we would like to call your attention. Mr. Kells has not been appointed secretary of the Electric Industrial Truck Association. The secretary is Mrs. Vivian R. Mills, and the Association office is at 208 So. La Salle Street, Chicago, Illinois.

Mr. Kells is director, or manager, of the Educational Program. While he makes his headquarters in Pittsburgh, all mail for the Association should go to the Chicago address.—D. L. Darnell, Chairman, Committee on Market Analysis and Development, Electric Industrial Truck Association.

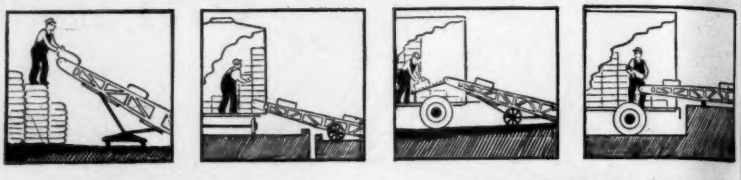
To FLOW:
Who's to Blame?

We have received your November copy of FLOW.

On page 47 is an illustration

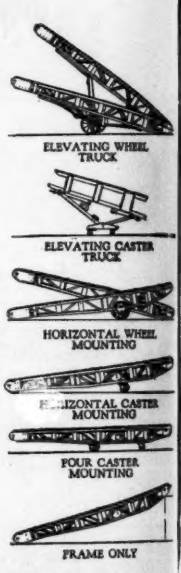
(Turn to page 54)

SAVE MAN POWER - CUT COSTS - SPEED DELIVERY
IN
Warehousing & Distribution
of Loose or Packaged Products



PORTABLE CONVEYORS
BY *Farquhar*

THE FEATHERWEIGHT
MODEL 391



Farquhar Portable Featherweight Conveyors handle bags, boxes, cases, cartons, crates, hampers, etc., with speed, economy and trouble-free daily performance. Featherweights are right for every shipping and warehousing need . . . carry in either direction, have the flexibility of mounting shown in the models at right. They'll handle items weighing up to 125 lbs. and 24 inches or more in width at a rate of 25 per minute. Farquhar builds Portables for every loading, unloading and materials handling problem . . . for any kinds of loose or packaged goods.

Write or wire Farquhar Portable Machinery Division today.

Flexibility of mountings to fit your requirements is shown in sketches.

It Pays to Convey the Farquhar Way

PORTABLE OR PERMANENT MATERIAL HANDLING CONVEYORS FOR
COAL · COKE · SAND · GRAVEL · BAGS · BOXES · CRATES · CARTONS · BARRELS · ETC.

PORTABLE MACHINERY DIVISION

1856 NINETIETH ANNIVERSARY YEAR A. B. FARQUHAR COMPANY 1946

"Our 11 BAKER TRUCKS have given us Continuous 24 hour service for 4 years"

Routine periodic inspection and lubrication pays substantial dividends in the operation of Baker Trucks at Thompson Aircraft Products Company's mammoth new Cleveland plant.

Here is a good example of what can be expected of Baker Trucks in the way of *continuous operation,* when properly cared for. According to N. J. Shibley, Superintendent of Building and Property Maintenance at Thompson, their Baker Crane Truck and ten Baker Fork Trucks are as good as new after serving three shifts per day for nearly four years—the equivalent of 12 years of normal service. No truck has been overhauled, there have been only a few minor mechanical failures, and maintenance has been almost negligible.

Actual time out of service averages less than ½ hour per day, per truck, divided as follows:

Daily check of Hydraulic System . . .	**5 min.**	**Other maintenance (Tires, brakes, inspection and adjustment of electrical controls, etc.) 45 hrs. per month for 11 trucks—per day . . . . . 10 min.**	
Battery changes (2 min. each shift) .	**6 min.**		
Weekly lubrication (45 min.)—per day	**7 min.**		
Total .	**28 min.**		

Except for the above and for a ten minute period between shifts when trucks are idle, they have been giving "round-the-clock" service for four years and, says Mr. Shibley, "if we continue to take good care of them, they should last indefinitely." That's *Continuity!*

To help you keep your Baker trucks operating continuously and to insure long life, write for "Industrial Truck Care Pays You Dividends."

BAKER INDUSTRIAL TRUCK DIVISION
of The Baker-Raulang Company
2185 WEST 25TH STREET • CLEVELAND, OHIO
In Canada: Railway and Power Engineering Corporation, Ltd.

Baker INDUSTRIAL TRUCKS

HERE ARE A FEW OF THE MANY USERS!

ALL INDUSTRY

RAILROADS

Baltimore & Ohio R. R.
Chicago, Milwaukee, St. Paul & Pac. R. R. Co.
Illinois Central System
New York Central System

CERAMICS

Hazel-Atlas Glass Co.
Johns-Manville Products Corp.
The Glidden Co.
U. S. Gypsum Company

RUBBER

Goodrich Rubber Co.
The Goodyear Tire & Rubber Company
Kelly Springfield Tire Co.
U. S. Rubber Co.

FOOD

Armour and Company
Campbell Soup Company
The Cudahy Packing Co.
General Foods Corporation
Heinz, H. J. Co.
Kellogg Co.
Kraft Foods Company
Kroger Grocery & Baking Co.
Libby, McNeill & Libby
Lipton, T. J. Inc.
Swift & Company
Wrigley, Wm. Jr., Co.

PRINTING

Brown & Bigelow
The Cuneo Press, Inc.
Meredith Publishing Co.
Rand McNally & Company
U. S. Printing & Lithograph Co.

MACHINERY

Allis-Chalmers Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse Elect. & Mfg. Co.

EQUIPMENT

Bendix Radio Div., Bendix Aviation Corp.
Dodge Manufacturing Corp.
General Bronze Corporation
National Cash Register Co.
Radio Corp. of America

TEXTILES

American Viscose Corp.
Cen-Tennial Cotton Gin Co.
Industrial Rayon Corp.

MANY HAVE FOUND TRANSPORTERS

SAVES THE MAN...LIGHTENS HIS LOAD...TAKES THE WORK OUT OF A JOB

CONTROLS IN STEERING HANDLE

All movement of the Transporter is controlled by gentle touch of the hand and thumb. Operator simply rests his palm on the cross handle, applies easy thumb pressure to the button, and away goes a 6000-pound load at creeping or walking speed, forward or reverse. Simple as turning the ignition in a car, effortless as a pleasant walk.

POSITIVE MECHANICAL BRAKE

Again, operator has complete control of stopping as well as starting with absolutely no manual effort. The thumb is released, power automatically shut off, and Transporter comes to a gradual stop. Guide handle to vertical position and heaviest loads come to an instant stop. Everything is completely mechanical . . . nothing left to human error.

"DEAD-MAN" CONTROL

Day-dreaming, inattention or sudden distraction from work cannot endanger the operator or the load with Transporter "Dead-Man" Control. When the hand is taken off the steering handle, it flips back to its normal position, and the Transporter stops dead. It becomes inoperative *immediately.*

SHOCKLESS HYDRAULIC LIFT WITH EASY FOOT CONTROL

Simple foot pressure on almost ground level lever raises load to position for horizontal movement. No standing on lever, no straining of leg muscles. The load goes up gently, safely, evenly. Same easy foot pressure lowers load at any speed, without shock, without jar, without danger to the most fragile load.

● Today thousands and thousands of Automatic Transporters are in use the country over. As you can see from the partial list of users shown above, daily they haul anything and everything for every kind of business...have been doing so for years. Truly a miracle electric truck, it is the only one that is completely industry tested . . . the only one that has withstood the test of time.

It has built-in features that save the man . . . that end back-breaking human toil. It saves so much, that many have amortized its cost in four months or less. Let us show you how it happily combines advantages for both management and labor . . . how much it lightens life's loads. Mail the coupon for complete facts.

***If it isn't* AUTOMATIC, *it isn't a* TRANSPORTER**

XUM

Y IS USING THEM!

AUTOMOTIVE

Edw. G. Budd Mfg. Co.
Cadillac Motor Car Div. G.M.C.
Ford Motor Company
GMC Truck & Coach Div., GMC
International Harvester Co.
Mack Trucks, Inc.
Packard Motor Car Company
Stewart-Warner Corporation
The White Motor Company

CHEMICALS

Abbott Laboratories
The Dow Chemical Company
Du Pont de Nemours, E. I. Company
Monsanto Chemical Company
Parke, Davis & Company
Sherwin-Williams Co.
United Drug Company

METAL PRODUCTS

Aluminum Company of America
The American Brass Company
American Can Co.
Continental Can Company, Inc.
Crane Co.
National Lead Co.
Remington Arms Company, Inc.
Simmons Co.
SKF
Timken Roller Bearing Co.
Worthington Pump & Machinery Corp.

STEEL

Acme Steel Company
American Steel Foundries
Bethlehem Steel Co.
Carnegie Illinois Steel Corp.
Jones & Laughlin Steel Co.

PAPER

Container Corporation of America
Crown Zellerbach Corp.
Dennison Manufacturing Company
Eastman Kodak Company
Gaylord Container Corporation
Heco Envelope Company

OTHER INDUSTRIES

American Tobacco Co.
Canada Dry Ginger Ale, Incorporated
Carrier Corporation
The Detroit Edison Company
Endicott Johnson Corporation
The Globe-Wernicke Co.
Long Bell Lumber Co.
P. Lorillard Co.
Pullman Standard Car Mfg. Co.
Spiegel, Inc.
Underwood-Elliott-Fisher Co.

CUT HANDLING COSTS IN HALF!

FRONT WHEEL POWER DRIVE

This feature permits the Transporter "to turn on a dime." It gives complete freedom in maneuvering sharp corners and making turns in narrow aisles. It will turn a full 210 degrees with constant power. Only Transporter has this Front Wheel Power Drive. Back Wheel Power Drive Trucks can't begin to provide such time and energy-saving "turnability."

LOWEST OPERATING COST

The Transporter is the only material handling electric truck that provides maximum power for a full day's hauling and yet uses *only* an ordinary light socket for 5 hour recharging. Current cost is 10c to 11c a day based on an electric current cost of 2c a kilowatt hour. Again, no other electric truck can approach such economy in battery, charger and current cost.

Lightens LIFE'S LOADS

AUTOMATIC TRANSPORTATION CO.
Div. of the Yale & Towne Mfg. Co.,
141 West 87th Street, Dept. B, Chicago 20, Ill.

Please send me complete information about Transporter, the mirac
electric truck, and how it can cut my material handling costs in ha

Company Name.....

By.....Position.....

Street Address.....

City.....State.....

XUM

CUT "BACK-BREAK" and you CUT COSTS!

Yale Hoists—hand chain and electric models—are efficient time and labor savers that make light work of heavy lifting jobs—conserve worker energy, speed production and maintenance and cut handling costs.

Yale Hand Lift Trucks are ruggedly built for long life—provide easy lift, easy roll, easy steer—take the shorter hauls at a fast clip. Wide range of models and capacities for handling skids, skid bins, and pallets.

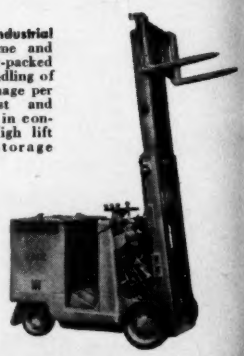
Kron Springless Dial Scales, made by Yale, eliminate excessive time- and money-wasting handling operations, provide accurate, efficient, low-cost weighing and counting of all kinds of materials. Available in all types from bench to crane scales.

● Here's a job that *could* be a "back breaker", but with the Midget King Electric Hoist, mounted on a jib crane, this worker quickly and safely raises a heavy casting and swings it to his machine. A mere twist of his wrist on the one-hand, bar grip control operates the hoist; light pressure from his free hand guides the load. Such efficient handling is easy on muscles, gives the worker more time for productive jobs, speeds lifting and shifting, eliminates wasteful rehandling . . . *cuts costs.*

Engineered and built to exacting Yale standards, the powerful, high-speed, economical Midget King embodies maximum ruggedness, strength, and simplicity of design. Compact, light in weight, giving long-life, dependable service, it is the ideal electric hoist for loads up to 2 tons.

Why pay out "muscle money" to keep material on the move? It adds nothing to product value, only to production costs. Let Yale give you complete details about the Midget King and other time-saving, cost-cutting material handling machinery. A Yale representative is nearby. Phone or write today.

The Yale & Towne Manufacturing Company
4530 Tacony Street Philadelphia 24, Pa.



Yale Electric Industrial Trucks save time and effort—arepower-packed to speed the handling of tremendous tonnage per day—travel fast and maneuver easily in congested areas. High lift models save storage space.

MATERIAL HANDLING MACHINERY

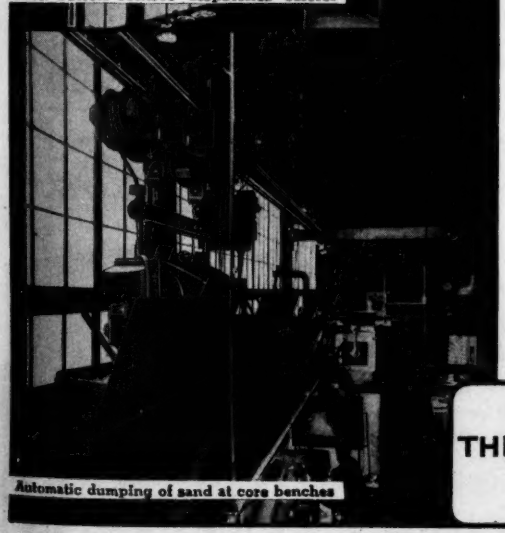
CUTS HANDLING COSTS . . . SAVES TIME . . . SAVES EFFORT . . . PROMOTES SAFETY

HOISTS—HAND AND ELECTRIC • TRUCKS—HAND LIFT AND ELECTRIC • KRON INDUSTRIAL SCALES

Automatic MONORAIL System

Loading bucket at speedmuller

Push button control dispatches carrier



Automatic dumping of sand at core benches

DELIVERS CORE SAND TO 9 STATIONS

FROM a simple push button control, operator of speedmuller keeps nine core makers supplied with fresh core sand at all times.

This system operates as follows — Self-dumping bucket is lowered to floor at speedmuller to receive core sand. Operator raises bucket with twin hook hoist, sets the station selector and then presses starter button. The unit runs to the proper station and stops — bucket makes complete revolution dumping sand in hopper — whereupon the unit returns to loading station. All this operation occurs automatically, with no further attention from operator.

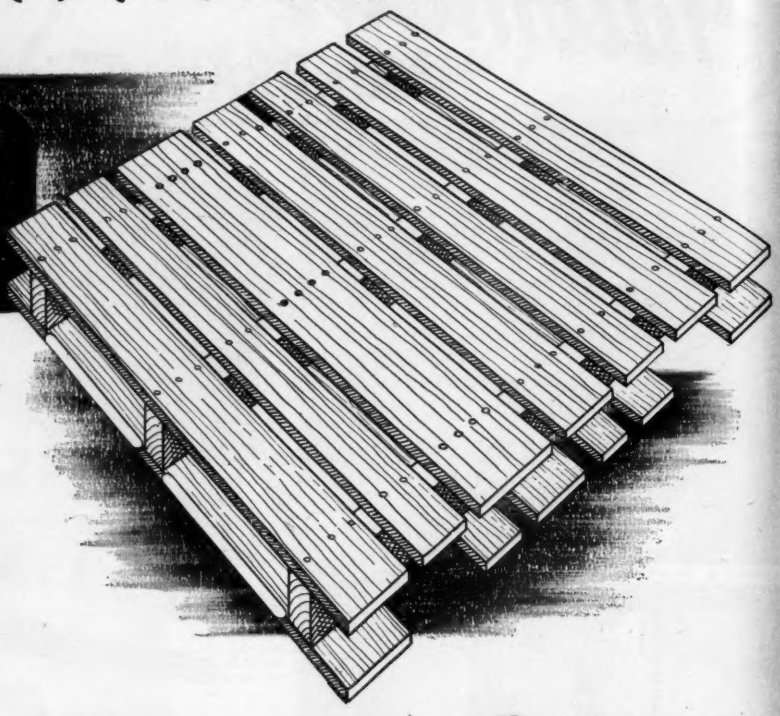
This is just another of the many automatic systems designed by American MonoRail Engineers using the American MonoTractor. Let us tell you more about this rubber wheel drive unit. An engineer will consult with you without obligation.

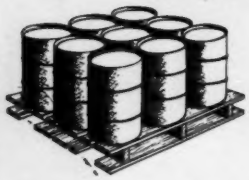
THE AMERICAN **MONORAIL** COMPANY

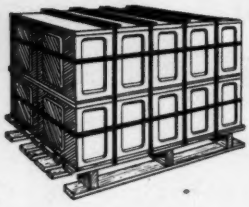
13129 ATHENS AVE. ● CLEVELAND 7, OHIO

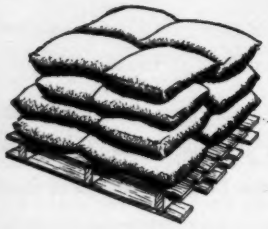
THIS OR THIS

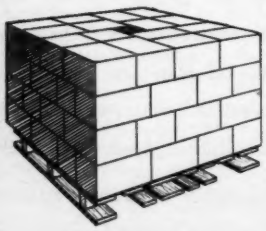
"GENERALIFT" PALLETS FOR THE QUICKER AND EASIER HANDLING OF HUNDREDS OF PRODUCTS

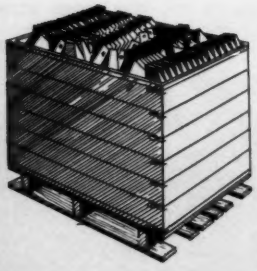












Generalift Pallets

★ ★ ★ ★ ★

SAVE 50% TO 90%

The U. S. Navy reports many examples of savings of 50% to 90% in materials handling through the use of pallets and fork lift trucks. In some cases, even greater savings resulted. Instead of picking it up and laying it down—moving it piece by piece—many items can be consolidated into single loads—palletized—moved as *one.*

Result: one workman and fork lift truck do the work of many . . . reduce handling costs, save time and packaging materials . . . protect shipments from costly damage in transit . . . simplify warehousing and taking of inventory (count pallets instead of each item).

Hundreds of products can be shipped easier, handled easier, and stored easier with Generalift Pallets. Write today. Let us tell you more about this modern, *economical* method of materials handling.

Generalift Pallets, Skids, and Lift Boxes are made of sturdy hardwood construction. Designed for long life, rough handling, extra heavy loads! Generalifts are made to meet *your specific requirements.*

ALL TYPES OF ENGINEERED SHIPPING CONTAINERS

GENERAL BOX COMPANY

GENERAL OFFICES: 60 West Illinois St., Chicago 10, Illinois
DISTRICT OFFICES AND PLANTS: Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon.
Continental Box Company, Inc.: Houston, Dallas.

SEND FOR FREE COPY OF BOOKLET ON "GENERALIFT" PALLETS

ECONOMIZE . . . PALLETIZE . . . GENERALIZE!

WRIGHT

HIGH LIFT TRUCKS *are available*

IN A WIDE RANGE OF MODELS and PLATFORM ELEVATIONS

THIS company was the original manufacturer of industrial electric trucks and the name *WRIGHT* has stood for the acme in construction, ease of operation and serviceability for over a quarter of a century. We were not only the first to manufacture the (Elevating Platform type) small industrial electric truck but in addition the small Carrying, High-Lift or Tiering and Telescoping models.

Today we offer a full line of small trucks which will do any of the work of the so-called larger trucks and these are available in a wide range of models, capacities and specifications. Our catalog illustrates and describes the various models. *Write for your copy for reference.*

SPECIAL MODELS

For special applications we are prepared to furnish trucks which are variations from the standard line. Let us assist you with your materials handling problems.

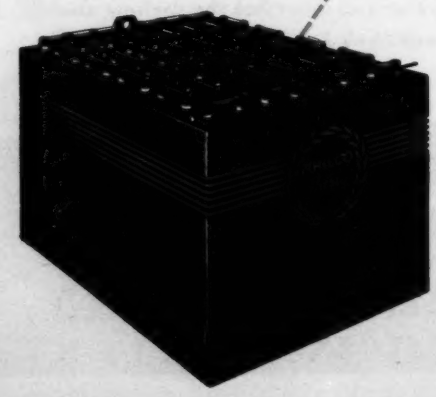
WRIGHT TRUCK

WRIGHT ELECTRIC TRUCK CO., INC.

NEW YORK

New ways to save with PHILCO BATTERIES

Now you have palletized unit loads, and the new long-life Philco "Thirty" motive power batteries to make modern electric trucks even more useful and economical. The 30% longer life of Philco "Thirty" means substantial savings in battery replacements. Ask for Philco "Thirty" as initial equipment in your new trucks. Specify Philco "Thirty" on battery replacement orders. Write for specification data today. PHILCO CORPORATION, Storage Battery Division, Trenton 7, New Jersey.



PHILCO

FOR 50 YEARS A LEADER IN INDUSTRIAL STORAGE BATTERY DEVELOPMENT

XUM

Flow

The magazine which integrates material handling equipment into the flow of production.

Vol. 1, No. 5

FEBRUARY
1946

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COVER PHOTO—Refrigerator mechanical units stay on the mile-long conveyor from receiving to shipping. Here the line dips the assemblies into a glass vat, completely submerging them. As they move by, the operator watches for possible leaks. See story on page 14.

IT DOES THE WHOLE JOB . . . . . .

Without once leaving the system, a million mechanical unit assemblies travel for a solid mile through receiving, assembly, finishing, testing and inspections.

HOW receiving and shipping operations can be balanced through proper handling aids, and synchronized with the over-all production flow, is well exemplified in the household refrigerator mechanical unit line at the Kelvinator Division of the Nash-Kelvinator Corporation, Detroit. A mile-long overhead chain conveyor starts at the warehouse for subassembly storage (where both the receiving and shipping departments are located) and ends at the shipping department, carrying mechanical unit assemblies for home refrigerators. The loads are attached to the conveyor by means of specially built rectangular steel racks with eyes at the top which thread over hooks. The incomplete units arrive at the plant in these racks and are then shipped in the same racks as complete assemblies.

Tiered shipping frames, left, are spotted; racked units are hooked on monorail. At end of slat conveyor, frame receives assemblies.

Center: Racks are properly positioned during assembly. Troughs below conveyor sections contain fastening devices used for units.

First evacuation station, below; Conveyor loops time travel to next station. Vacuum pump on casters follows the units to bend.

Beginning To End

Thus the conveyor (and rack) system not only transports subassemblies, but also increases storage facilities for these units. By "snaking back and forth" the conveyor acts as a storage area for parts awaiting machining operations; it sets a pace in assembly and testing lines; converts into productive manufacturing space several areas formerly used for storage; climbs high toward the ceiling in order to keep the apparatuses out of the way of production; eliminates danger of damage loss due to "bumping" and positions work in process at the proper height. In short, it is both a storage and processing conveyor; and because of its ability to "climb" the floor between operations is kept clear of obstructions.

A Cooperative Worker

Many handling aids are built into and around the system, including revolving tables ("merry-go-rounds"), roller conveyors, slat conveyors, and switch boxes mounted on trolleys that parallel the chain conveyor in the testing department. Fork lift trucks and hoists also help to balance the flow.

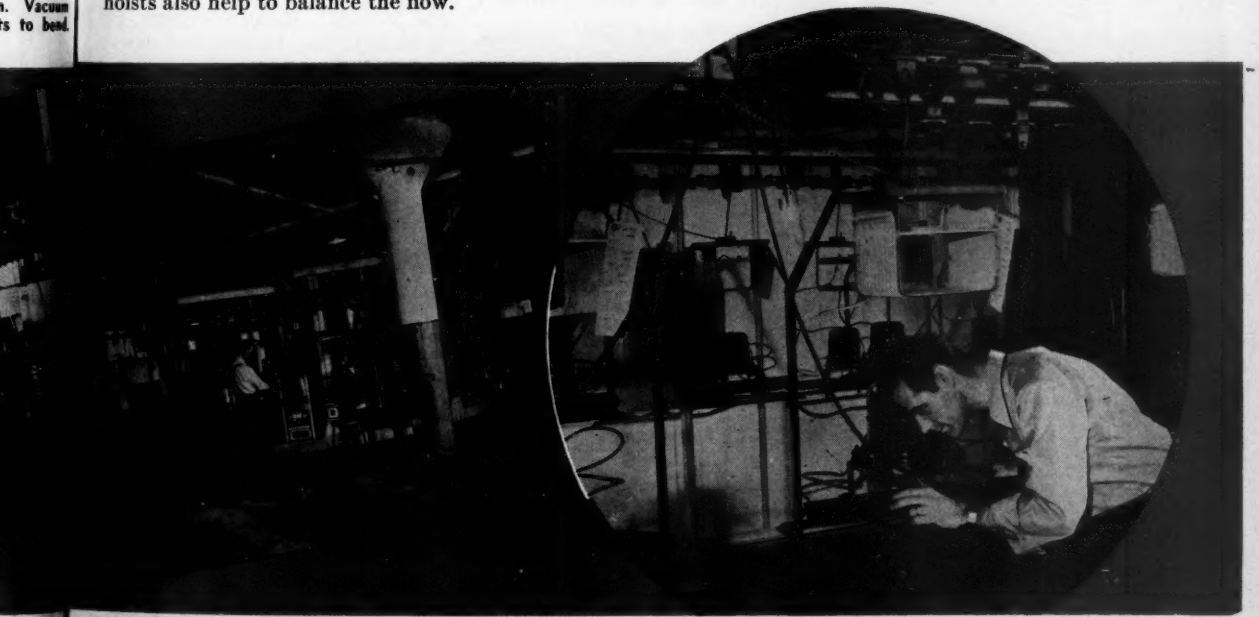
For an understanding of the production setup, it is necessary to explain that Kelvinator formerly built the cabinets at Grand Rapids, Michigan, and shipped them to Detroit plant for final assembly. Now the much smaller motor units, built at Detroit, are being shipped to Grand Rapids where also the final assembly of the refrigerator takes place.

Clever "Two-Way" Racks and Frames

At Grand Rapids, motor unit assemblies are removed from the racks, which must be returned to Detroit. To take advantage of the return of the empty racks, the Grand Rapids plant now attaches the evaporator units to their tops. In this way the empties on their return trip now serve the purpose of simplifying the shipping operations between the two plants. Thus the assembly of the motor unit now also includes the evaporator subassembly, held at the proper height in the rack above the motor. The mechanism which will operate the refrigerator is so assembled on the rack that its inclusion in the cabinets at Grand Rapids is a matter of simple insertion. Copper tubing and welded pieces are also protected against bending or damage that may cause leaks resulting in a loss of the gas charge. The racks take the motor and evaporator unit through all the assembly, cleaning, finishing, testing operations, and then to the Grand Rapids plant for insertion in cabinets. As stated, the same racks then carry back to Detroit the evaporator unit to start another assembly.

As previously mentioned, the operations begin and end in the receiving and shipping room located in the warehouse. Here also, a few feet apart, are the loading and discharge stations of the mile-long conveyor.

The racks containing the evaporator unit are received in specially built angle iron frames. The racks thread into these frames—three in the rear and three in the front row.



Conveyor circling second evacuation station, bottom, left, where units receive charge. At end of loop, units proceed to testing.

In inspection tunnel, right, assembled units on racks are connected to electric switch boxes, which keep pace with the conveyor.

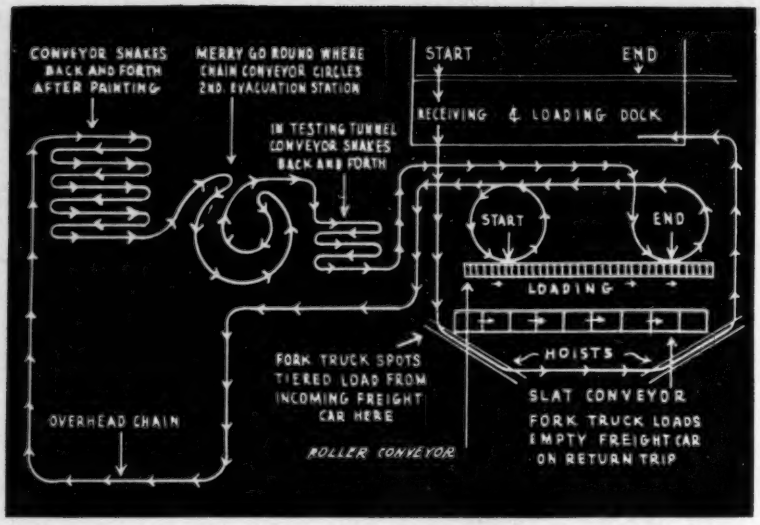

CONVEYOR SNAKES BACK AND FORTH AFTER PAINTING
MERRY GO ROUND WHERE CHAIN CONVEYOR CIRCLES 2ND. EVACUATION STATION
IN TESTING TUNNEL CONVEYOR SNAKES BACK AND FORTH
START
END
RECEIVING & LOADING DOCK
START
END
LOADING
HOISTS
FORK TRUCK SPOTS TIERED LOAD FROM INCOMING FREIGHT CAR HERE
SLAT CONVEYOR
FORK TRUCK LOADS EMPTY FREIGHT CAR ON RETURN TRIP
OVERHEAD CHAIN
ROLLER CONVEYOR

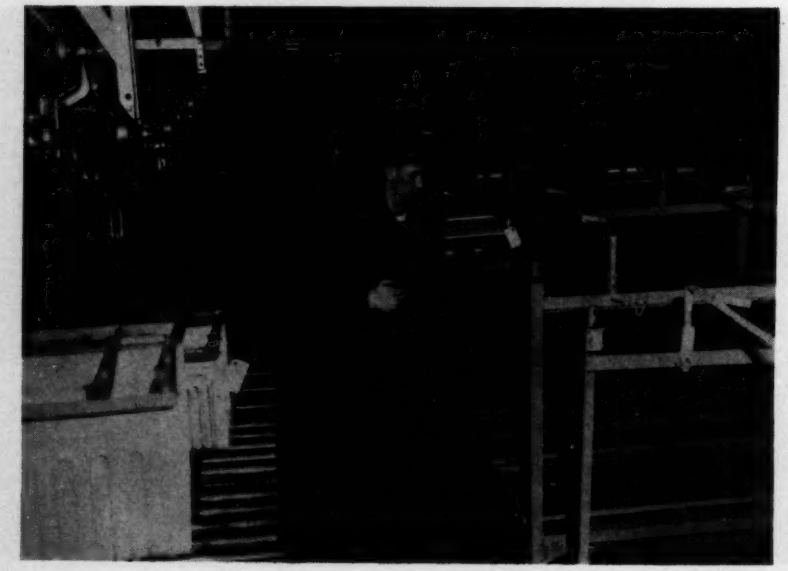
Diagram of mile-long line: product does not leave conveyor until ready for shipment.

The steel frames are so designed that the four tapered ends of the vertical corner supports fit snugly into slots cut in the bottom four corners of the frame above. The frames are tiered three high (see photo) and are removed from the freight car by fork lift trucks. Thus 18 evaporator units (in three frames) can be spotted at the loading station of the chain conveyor in one haul.

An overhead hoist places the loaded shipping frames on a slat conveyor. The racks containing the evaporator units are removed to a roller conveyor (which is about two feet distant and parallel to the slat conveyor). The racks containing the evaporator units travel on the roller conveyor to a point where the overhead chain conveyor dips for loading. The rack is threaded over a carrying hook on the conveyor and is on its way to the first motor assembly operations. The empty frames travel a few feet on the slat conveyor to a point opposite the discharge end of the mile-long conveyor line. Here they are loaded with six racks containing the finished assemblies.

Thus the same frames that carry multi-unit loads to the loading station, after being emptied become immediately available for shipping purposes. They are carried past the shipping station on the slat conveyor at the proper height for convenient reloading. The same fork trucks that unload and spot the incoming material can on the return trip pick up the tiered frames (a few feet away) and load an empty freight car.

At unloading station, racked assembly is threaded into frame. Note hoist tiering full frames.



A Versatile Worker

The flow via the overhead chain conveyor through all the operations is interesting because of the many things the installation is made to do. Once the evaporator unit in the rack is on its way to receive assemblies, it does not leave the conveyor until the final assembly is removed for shipment. It passes high over production space and then dips down until the rack is within 30 inches of the floor. Here it passes a series of work stations where assemblies are made on the lower section of the rack. As the assemblies are built up on top, the conveyor dips again and so carries the work in process past all the stations at the proper height for the operators. And meanwhile the floor remains unobstructed. This is particularly important at the soldering and welding stations where long lengths of electric cords and gas hoses often trail on the floor as the workers move about.

After assembly of condensers, compressors, supporting frame work, copper tubes—and following soldering operations — the entire system is charged with dry compressed air for leak testing purposes as the conveyor carries the racks past air hoses suspended from the ceiling. If any repairs are necessary, the installation carries the rack in such a position that its bottom rests upon a section of roller conveyor. This gives the unit the rigidity that may be necessary while repairs are made.

After passing through a hot water rinse to remove flux, the conveyor dips into a glass vat, completely submerging the assembly and circling it past observers who note any leaks.

After drying in the oven while on the conveyor, the assembly is ready for painting. It is dipped into the paint vat up to a point below the stainless steel evaporator—an operation in which the conveyor again demonstrates its versatility.

Versatility is also evident in the following operation. It is desirable to create a vacuum in the system

in two operations some minutes apart. This "waiting time" is provided by having the conveyor make a series of loops before completing its transport from the first evacuation station to the second. For that reason no accumulation obstructs the flow and no rehandling is necessary.

At the gas charging station, the vacuum is intensified and the refrigerant gas is expanded into the vacuum. The refrigerant is forced in under presssure and is measured on gauges. (The refrigerant is, of course, in liquid form before expansion into the vacuum.) The numerous gauges at this point must be under observation and the charging must be done slowly. Instead of stringing the operation out by moving the charging and testing equipment along the path of the conveyor, and then back to the head of the line again, a revolving table or platform with 22 charging stations was installed. The overhead conveyor is routed around this "merry-go-round," and as the assembly begins to circle it is hooked onto the charging mechanism.

Moving Eliminated

At the completion of the circuit, the system is fully charged and the charging mechanism swings over to the start of the loop and is hooked up with another arriving unit. Thus the need of moving equipment around is entirely eliminated, and the worker remains at his station as the assembly passes by him. No rehandling is necessary.

With bottoms of racks securely held in shipping frames, the units are handled by truck.

Some electrical connections are now added, and a long trough under the conveyor catches any small nuts or screws that may be dropped. They are thus easily recovered.

Fork truck loads 18 assemblies in freight car. Note snug fit and maximum use of space in car.

A tunnel several hundred feet long serves as a testing lane, where the temperature is kept at 90°. As the conveyor snakes back and forth, the motors in the assemblies are kept running by plugging the electric cords in switch boxes mounted on trolleys which travel on monorails that are parallel to the chain conveyor. These trolleys follow the assemblies and furnish electric current to keep the motors running through the testing period. This arrangement has saved hundreds of manhours formerly spent in rehandling.

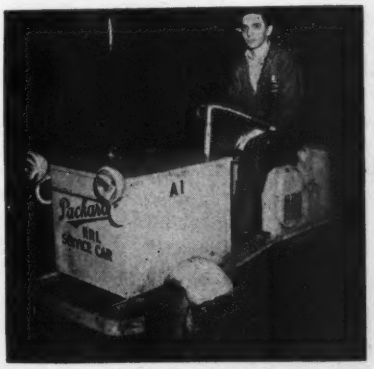
After defrosting, the inspected units are carried by the conveyor to the shipping department in the warehouse previously mentioned. As the conveyor dips at the discharge station, the rack containing the assembly is taken off and slid on a roller conveyor into an angle iron frame. The latter is positioned on the slat conveyor at the proper height for loading. When six racks have been threaded into a frame, the slat conveyor moves it underneath the span of a hoist, whose grab picks up the load. The hoist tiers the interlocking frames three high on the floor.

A fork truck then inserts the forks under the complete unit containing the 18 racked assemblies. Two curved arms at the top of the truck tower clamp down on the middle frame, securing the load. The truck then moves the multi-unit load into a waiting freight car. The frames were so designed that 48 of them completely fill a standard car.

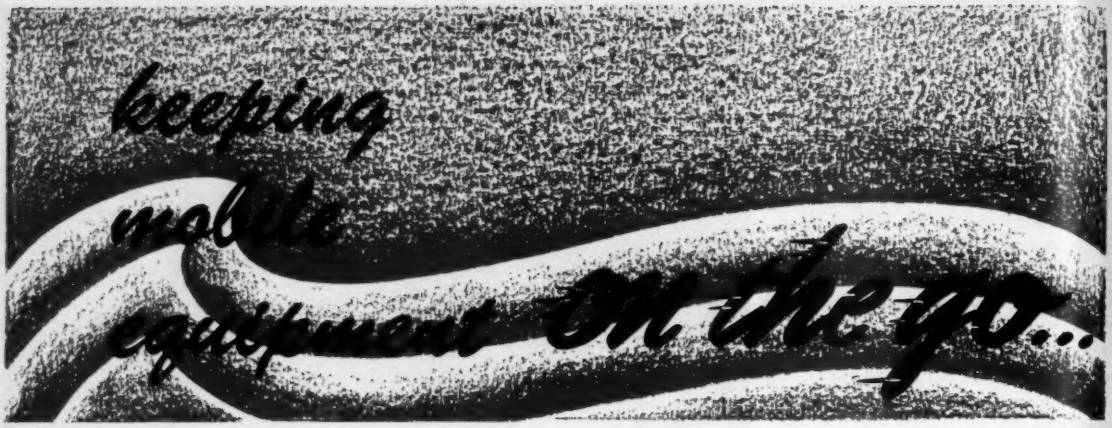
This exceptionally well-balanced line is the result of much planning.

Because of the efficiency of the over-all operation, this Kelvinator plant will turn out more than 1,000,000 units annually.

TRAVELING SHOP—This three-wheel powered truck makes possible speedy repairs of minor breakdowns on mobile equipment



operating in the many buildings of the Packard Motor Car Co. Time lost in hauling defective trucks to a central maintenance and repair department is thus avoided. The service truck shown carries tools and small parts to the place of breakdown and makes repairs on the spot.—*Courtesy, Packard Motor Car Co.*



Maintaining the flow of materials to storage, production, and shipping doesn't just happen. Here is how the Internal Transportation Department does it at the Goodyear Tire and Rubber Co. Can you apply some of the control features used in your plan?

•

BY VICTOR J. PAUL

Internal Transportation Department
Goodyear Tire and Rubber Co.,
Akron, Ohio

GIVEN the proper amount of mobile equipment for moving the tonnage involved, the next essential thing is an adequate organization that will assure two things: 1. Maximum utilization of the equipment. 2. A systematic flow of materials between departments and buildings.

This is the responsibility of the Internal Transportation Department of our company at Akron. Each of the three plants, located on the same grounds, maintains its own internal transportation department. The organization of each department is similar to that of the other two. For that reason the present description of the Plant No. 1 organization applies, with one or two exceptions, to the organizations of Plants Nos. 2 and 3. The few exceptions are designed to avoid duplication of effort. They are as follows.

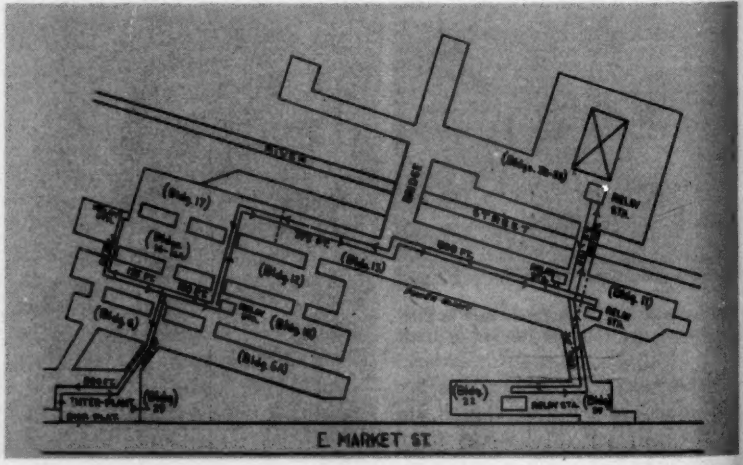
In Plant No. 1 an individual is responsible for the maintenance of all equipment in the three plants.

•

(The January FLOW article "Systematic Maintenance for Tireless Workers" describes the company's preventive maintenance program. —Ed.) In Plant No. 1 there is also a person whose responsibility it is to organize operations for piece work and quantity check of in-process material being moved from one department to another. The department in Plant No. 1 also attends to the scheduling of interplant loads that are hauled by over-the-road tractor and trailer units between the three plants. With the exceptions noted, the internal transportation organization of each plant is a duplicate of the other.

Organization of Department

Here is how our department is organized. In direct charge of internal transportation is the department foreman, who reports to the department manager. Since the plant operates on a 24-hour schedule, three shift foreman also are included in the organization. These shift foremen handle all matters pertaining to production control and the scheduling of operations. Each shift foreman, in turn, is assisted by a head supervisor. This arrangement always provides someone in charge, a person who can answer questions and make deci-



Main Aisle, right, is half a mile long. Through this main artery, connecting all buildings of plant, material flows on 24-hour schedule.

sions in the event an unexpected situation arises.

In view of the size of each plant concerned, additional staff members are provided in the form of nine supervisors—three on each shift. These men are stationed at various parts of the plant, and each one is assigned a definite area. It is their responsibility to see that the materials are kept moving on schedule within the areas assigned to them.

This organization is required in view of both the tonnage and the amount of mobile equipment involved. An idea of the scope of the operation can be obtained from the fact that, all told, 4,635 hand and power operated trucks of all kinds are used in the three plants. Of these, the powered equipment amounts to about 135 pieces.

Another fact that has a bearing on the size of the internal transportation organization is the number of moves required by the loads. Not only does the volume handled amount to 15 million tons monthly but, due to processing and manufacturing requirements, a single load may have to be moved as many as 10 times from the time it is received as raw material to the shipping of the finished product.

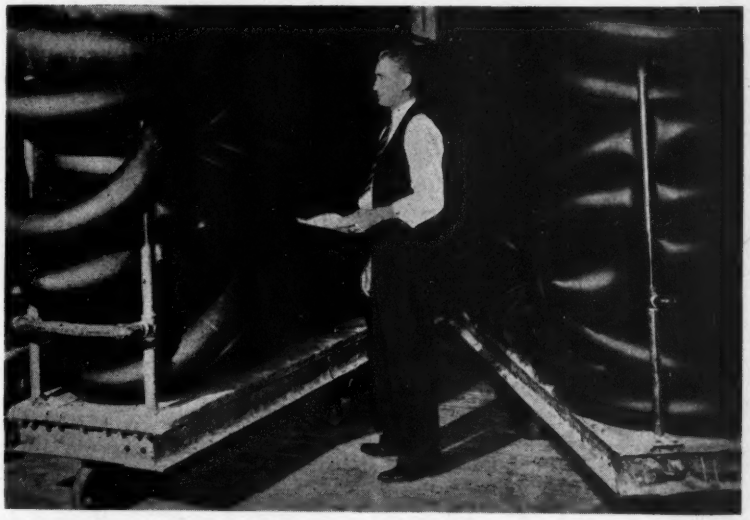
Interplant Movement

Plants One, Two and Three are located (on the same grounds) approximately one mile apart. Plant No. 1 produces truck and other tires for industrial use, Plant No. 2 passenger car tires and mechanical goods, and Plant No. 3 is a warehousing and shipping operation. A considerable tonnage is scheduled daily between these three units by the tractor-trailer units. (Like the in-plant trucks, the trailers also operate on a 24-hour schedule.) The average capacity of the trailers is approximately 12 tons each.

A typical day's schedule, based on actual figures of a recent day, requires 124 individual trips involving a gross weight of close to 1,500 tons. The Internal Transportation Department of Plant No. 1 furnishes the garage a schedule of the material to be moved on any given day, and the garage in turn provides the necessary equipment. The

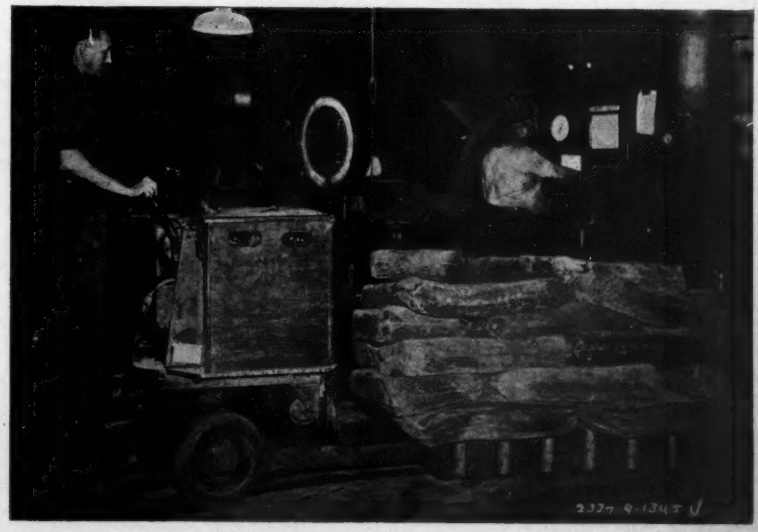
Interplant movement of material is shown in photo above. At each loading dock a powered truck is stationed for loading.

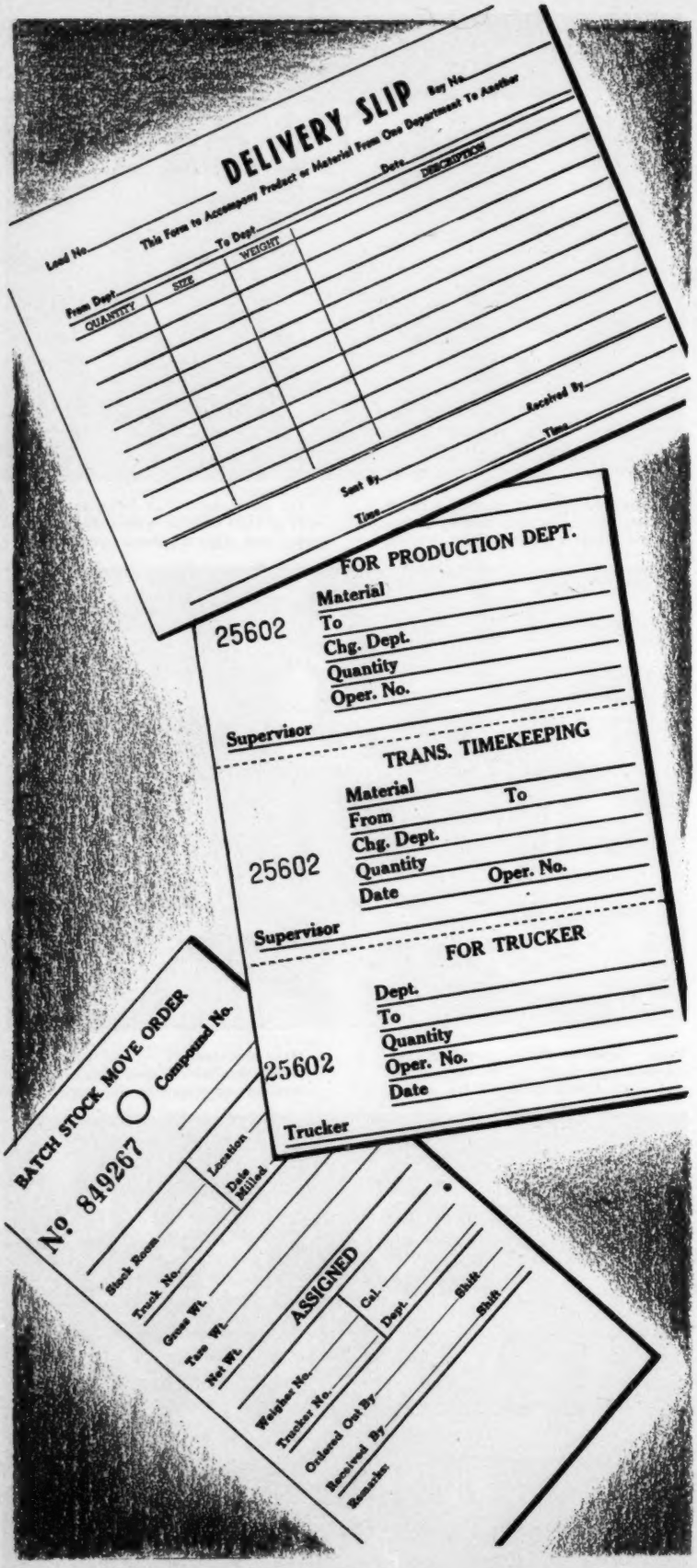
For movement of all interplant as well as in-plant material, various control forms are used. Typical examples on page 20.



Below: Since stocks are used by age, scheduling of loads is important. Truck shown may handle 1,750,000 lbs. weekly.

Many thousands of tons of products are moved regularly on short hauls between numerous operations by flat truck, above.





supervision provided by the department sees to it that the loads are kept moving without a hitch.

Speedy loading and unloading of material to and from the trailers at all transfer points is accomplished by means of powered equipment. A platform truck is stationed at each transfer point for this purpose. A powered truck will load a trailer in a matter of minutes, thus expediting the interplant movement of material.

Intraplant Movement—and Records

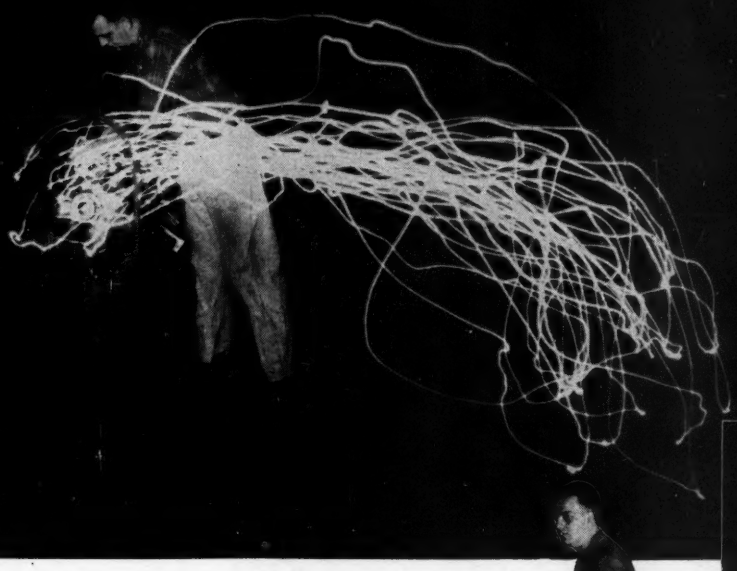
Since the movement of material is necessarily closely tied in with production, uninterrupted production is dependent on scheduled transportation of raw and in-process material. Hence, it is essential that proper records be kept of all loads moved. Specific examples of typical record forms are given in later paragraphs. Scheduled movement of loads is important in our type of operation for another reason. It is necessary to age stocks, which can't be used in less than 24 hours and must be moved within 10 days after processing. This means that the material must be taken out of storage by age limit. This is another reason for the importance of complete records of every load moved.

For serving a specific operation —mixing, say—a trucker will be given a schedule of the batches, showing the type of stock to be used in a given time. Thus the operator knows precisely how much material, and what kinds, he will have to transport for a given operation. It is his responsibility to move the stock so that the mill will be kept operating.

Here is a representative example of the control records maintained over the movement of the individual loads. The materials are received in railroad cars and are usually loaded on skids before being put into storage. The operator in charge of storage furnishes the Internal Transportation Department with a tally of the box car. The unloading gang checks the quantity in the car and makes out a receiving loading slip.

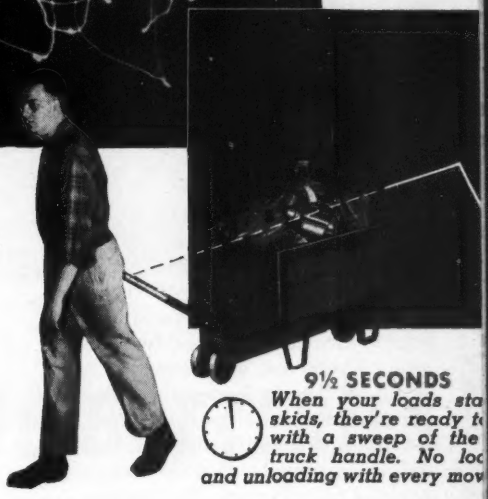
All material put in storage car-

Delivery Slip, top, is used between depts. Center form is used by production dept.; Bottom one is "Move Order." Article describes use of these forms fully.



10¼ MINU

Here act phc grap time being wc A bulb on worker's wri cords each as he shifts ings from fl platform t after machi The picture record of wa for every mc unnecessary!



9½ SECONDS

When your loads sta skids, they're ready t with a sweep of the truck handle. No loc and unloading with every mov

count the moves and count the cost!

Here the camera has caught a *few* of the costly moves in one typical plant routine. It goes like this: First the worker unloads castings from platform truck to floor. Next the machinist, as he completes individual pieces, places them in another pile on the floor. And finally, as shown above, the worker returns to *reload* his truck.

You can eliminate all this! Put your loads on *skids* and put an end to needless handling. Loads are ready to move at a moment's notice!

And just as Barrett Skids allow big, profitable *unit loads,* so Barrett Lift-trucks make them easy to move. Together they take materials from machine to machine . . . floor to floor . . . or in and out of trucks . . . with the speed and ease that enables *one man* to handle more than *3 or 4!*

Ask to see this Barrett Lift-truck System. A Barrett engineer will demonstrate without cost or obligation. For more information, write

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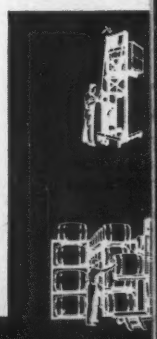
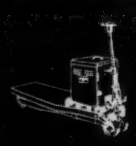
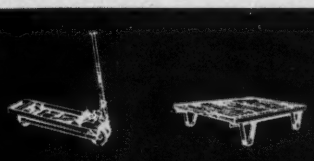


BARRETT

ONE MAN DOES MORE THAN 3 OR 4 . . . WITH A BARRETT



Barrett Handling Equipment



ries a tag which is made out in quadruplicate. This is the "Batch Stock Move Order." Note that it has spaces for all pertinent information—location, truck No., weight, etc. The white form is used for cost and followup purposes. The yellow form serves for paying the truck operator (for putting the load in storage). The pink form is also used for paying the trucker—for moving the load from storage to the first processing (banbury) operation. Note: The upper part of this form is for moving the load to storage, the lower part (headed with the word "Assigned") is used for moving it from storage to the initial processing operation. The cardboard copy, the quadruplicate of this form, remains on the load until the material is used up.

That is to say, until the stock comes out of the mixing machines. Then a new form is put on the load, which is used similarly to the one just described. In view of the many processing and manufacturing steps and the large variety of products made, a correspondingly large number of individual forms is used. These not only serve as a record for the truck operator's time and the amount of pay due him, but also to identify the material and the products at the various stages of manufacture. No purpose would therefore be served in giving a detailed picture of each type of record used. (The particulars of two other forms are given later since they are more generally applicable.) The main feature which most of the forms have in common is this. They show the time consumed in moving all in-process material from one operation to another. With some exceptions, a detachable coupon usually serves as the truck operator's pay stub, and the upper part is used for record and followup purposes.

Here, briefly, are the details on the other two forms previously mentioned. One, a cardboard form, is used by the production departments for showing the quantity produced of a given item—bicycle tires, for example. This one consists of three detachable sections. One is retained by the department, the second serves as a pay record for the truck operator who moved the load, while the third one is the "check stub" showing that the trucker moved the load. This stub is usually mailed to the Internal Transportation Department by the respective production department.

The other form, made out in triplicate, is the "Delivery Slip" that is sent along with material moving from one department to another. The pink form stays with the shipper; the yellow one is used for payment of the truck operator, while the white one accompanies the material to the final destination.

Main Trucking Aisle

A physical feature of importance to the movement of the material is the main trucking aisle which connects all buildings of plant No. 1. Similar aisles are also provided in the other two plants. Stations are located at strategic points along the aisle and conveniently near the various production department. Three high-speed trucks pass through this aisle constantly, moving material between buildings or stations. On short hauls, the individual stations are fed by hand trucks. The maximum total length of this main aisle is about one half mile, and the sketch on these pages shows its course and the location of the various stations.

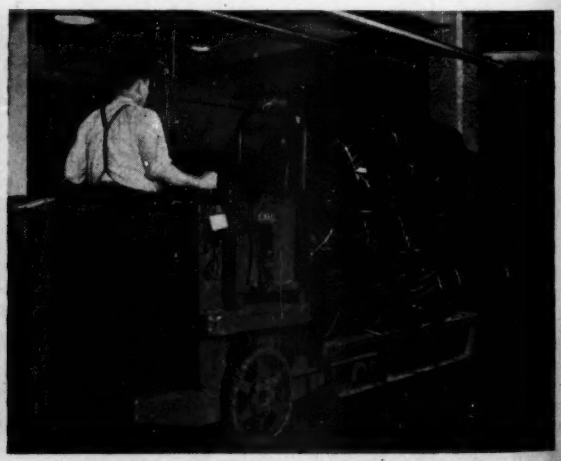
This, in brief, describes the organization and function of the Goodyear Internal Transportation Department, including some of the main types of control forms and methods used for keeping track of the vast tonnage handled through warehousing, processing, manufacturing, storage and shipping. By means of the particular type of organization and controls employed we are enabled to supply the production departments with new stock to keep the machinery running; and to take the product from the end of the process and position it ready for the next operation—at the right time.

(Another phase of the Goodyear Company's internal trucking operations will be discussed by the author in next month's issue.—Ed.)

FLOW CHANGES ADDRESS

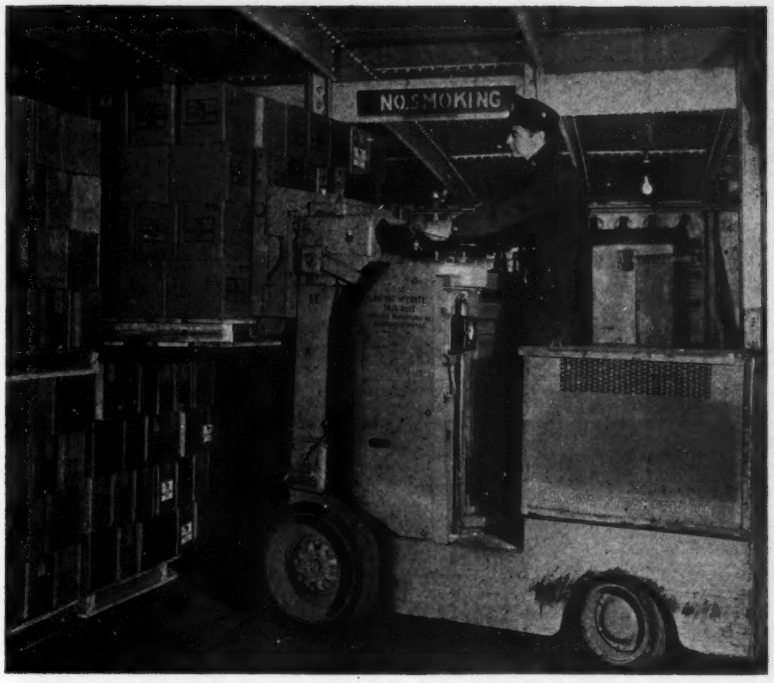
After March 1, the editorial and business offices of FLOW will be located in larger quarters at 1240 Ontario Street, Cleveland 13, Ohio. A prompt change on your mailing list will avoid delays.

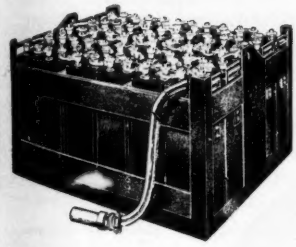
Here hand lift truck and skid method serves car loading. Thousands of hand trucks, of many types, also regularly serve production, storage.



At a relay station along Main Aisle: truck will move or load bicycle tires to other building. Diagram of aisle on first page of article.

BATTERY TRUCKS for Efficient Use of Power





...ALKALINE BATTERIES for Dependable Supply of Power

The handling operations necessary to keep work moving continuously through production are essentially stop-and-go-jobs which a battery industrial truck performs efficiently because it gets the necessary surges of power instantly from its battery, yet consumes no power during stops. Thus not only does it give high efficiency in the use of power, but the power it uses for battery charging is the lowest-cost power available.

Its electric-motor drives operate quietly, without vibration, and with almost negligible repair requirements. With batteries exchanged two or three times per 24-hour day, the truck is continuously supplied with power. One battery is charged while another operates the truck.

For continuous, 24-hour-a-day material-handling work, therefore, a battery industrial truck is an inherently economical and dependable machine... especially when powered by Edison Alkaline Batteries. With steel cell construction, a solution that is a preservative of steel and a fool-proof electrochemical principle of operation, they are the most durable, longest-lived and most trouble-free of all batteries. Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J. In Canada: International Equipment Company, Limited, Montreal and Toronto.

Edison
ALKALINE BATTERIES

WE ASKED THE MAN WHO MAKES THEM

A production increase of almost 100% at the Packard Motor Co. is the result of well-planned plant layout, a timed material flow, and a variety of handling equipment that brings parts and subassemblies to the right place at the right time.

THE Packard Motor Co., Detroit, now has a potential annual capacity of 200,000 cars as compared with the pre-war total of 109,000—in space that has been only slightly increased over that used in peacetime. This production feat was made possible by new facilities which incorporate the following features.

1. The use of mechanical handling devices to eliminate manual handling as much as possible. 2. Material movement that carries parts at the proper height for each worker as he performs his operations. 3. Layout and arrangement of equipment so that all operations are performed in their proper sequence. 4. The timing of the flow of parts and subassemblies so that they are available at the right time and in the right quantities.

The plant layout makes use of two floors. The upper floor is cut away above the final assembly lines, permitting easy assembly of the three main, heavy subassemblies—the chassis, the body and the front end.

Top photo: On second floor, bodies are moved on caster-mounted carriers propelled by drag-chain conveyor. Center: Chassis on slat conveyor receives motor from hoist. According to present plans, overhead conveyor will deliver motors to the line. Final assembly begins at end of slat conveyor.

Conveyors of various kinds move the bulk of material, and lift trucks, tractors, special carriers and electric hoists are coordinated in the overall operation. The use of the conveyors converts into productive manufacturing space areas which were previously employed for temporary storage of parts. The conveyors also keep work moving from station to station without rehandling, while at the same time serving as temporary storage areas for parts used in successive operations.

The Chassis Takes a Ride

Industrial trucks bring the frames into the building housing the final assembly lines and spot them along two parallel overhead monorails that are spaced at a distance which is the width of a car frame. On one of the monorails is suspended an elbow-like arm, and on the other monorail is a straight arm on a swivel. These arms travel on trolleys and are equipped with special clamps. The clamps are attached to the center of the outside cross-supports of the frame, at a point where the monorails dip to a convenient height for loading. The clamps permit the frames to be turned up in a vertical position and make possible temporary storage of hundreds of frames in minimum space.

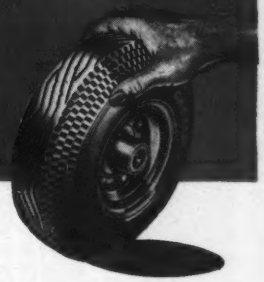
The monorails bring the frames to a series of initial assembly stations. At the first one, the frame is turned over in a horizontal position so that it will be readily accessible for the workers. This convenient positioning is made possible both by the flexibility of the clamps and the fact that the monorails rise or dip so that the work is carried at proper levels.

After passing assembly stations occupying several hundred feet, the monorails converge and enter a spray booth. Here the trolley carrying the rear end of the frame enters the booth first and then the trolley carrying the front end. This returns the frame to a vertical position once more, and a dip in the monorails at this point positions the work at the proper height. Since the long axis of the frame is now in the direction of movement, all parts of the frame are conveniently accessible for the spraying operation.

As the frame emerges from the

GENERAL PNEUMATICS

make light work of heavy material handling loads



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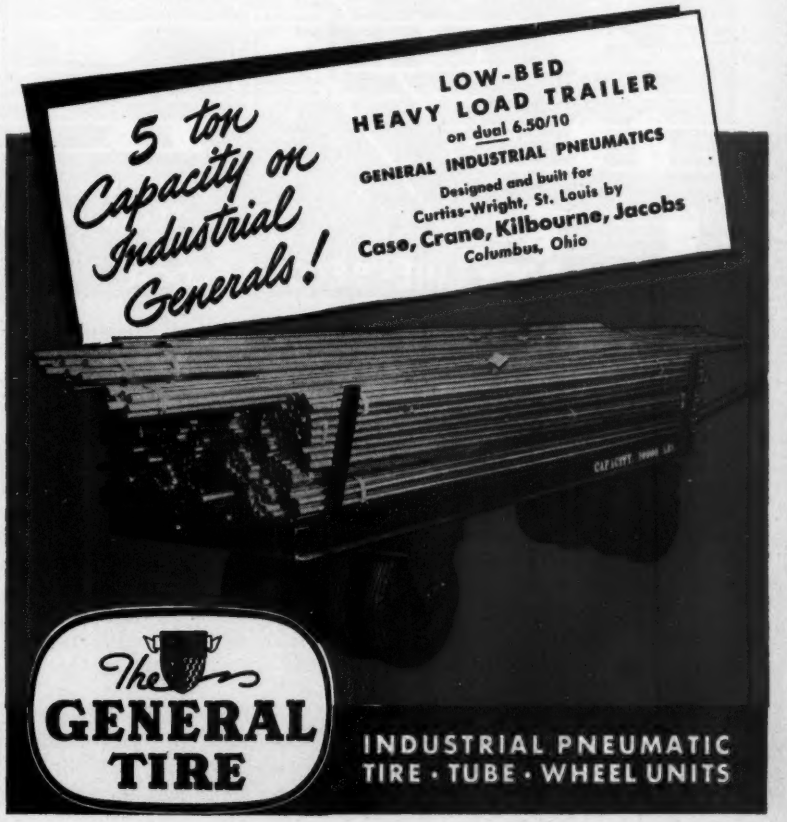


spray booth, the two monorails spread out again and thus return the frame to a horizontal position and ready it for transfer by hydraulic lift. Now the chassis begins to take shape. The hydraulic lift sets the frame in a crosswise position on a drag chain conveyor. The latter is set in a trough about two feet above the floor and runs at right angles to the monorails in the frame assembly line. The drag chain moves the frames at a slow speed and carries them at the right height for the clearing of the air bubbles from the brake lines and the insertion of the fluid. The steering gear is also assembled here.

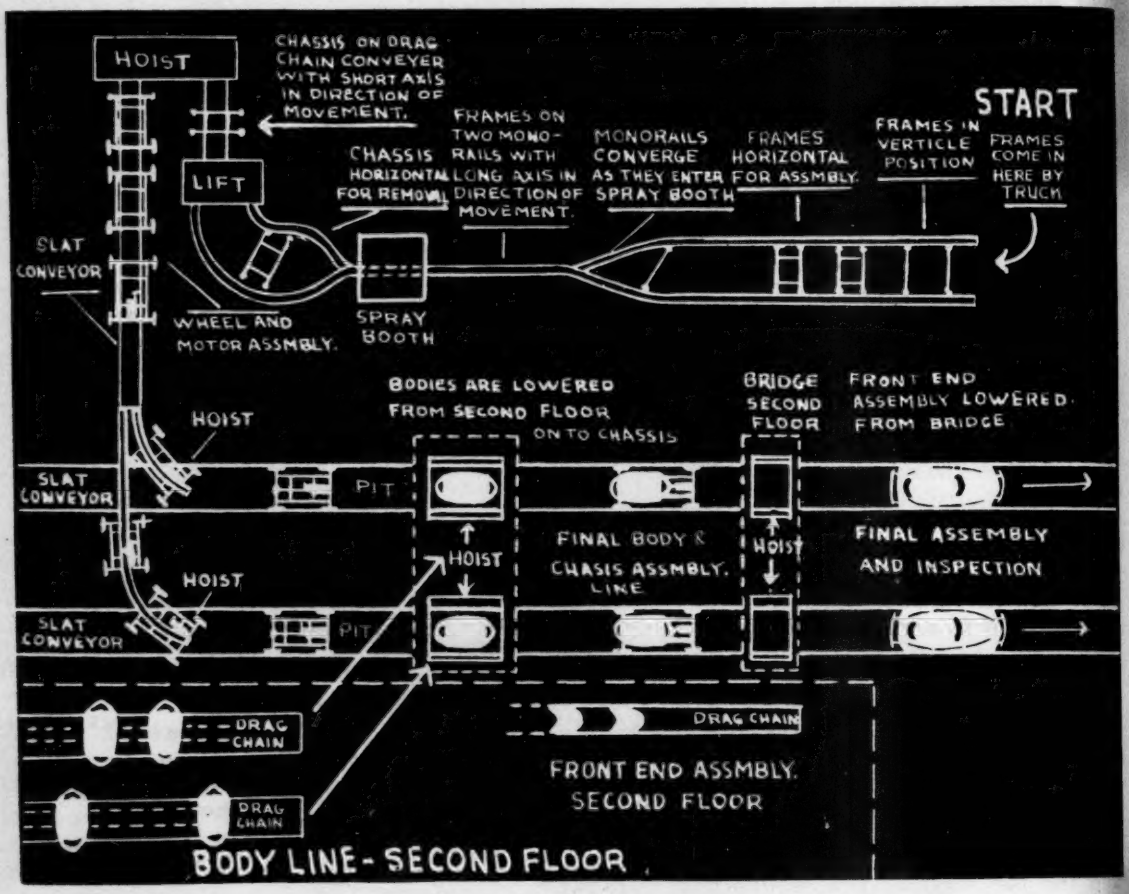
At the end of the drag chain is a hoist on a monorail which picks up the chassis and places it on a slat conveyor. It now rides in a lengthwise position. This slat conveyor parallels the drag chain line, but runs in the opposite direction. The slats have two fingers on each end which hold the cross-supports of the chassis in a rigid position, thus making heavy tightening operations possible.

By having the chassis ride the conveyor lengthwise, workers on opposite sides of the line can make similar assemblies at the same time. It is also in the only practical position for receiving the heavy motor.

It Takes Shape

As the chassis rides this long slat conveyor, the motor is lowered into place by hoist and installed, and wheel and other assemblies are made. Wheels and tires are brought to the work stations by overhead chain conveyors, which dip to convenient height for removal. Since on-the-floor storage space was saved by these long overhead conveyors, a similar installation is planned for transporting the motors.

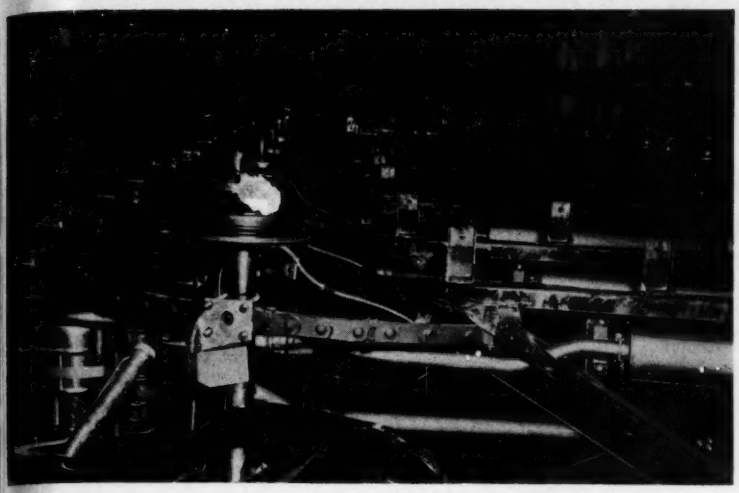
As the chassis reaches the end of the slat conveyor, an overhead hoist with a special grab lifts up the front end so that the assembly can be turned at right angles on the rear wheels and swung into position on a slat type conveyor (flush with the floor). Between these conveyors is a long pit where the final assembly lines move. (Two final assembly lines parallel each other here.) The chassis, now resting on all four wheels, travels over one of the long pits for final assembly and inspection. On these lines, the three big subassemblies—the chassis, body and the front end—become a Packard automobile.



Flow sheet of Packard assembly line is a good example of how proper layout can be an aid to production and eliminate excess handling. Product moves forward without backtracking or congestion.

The "Body Drop"

Above and to the rear of the start of final assembly lines is the end of the body line on the second floor. The beginning of this line is in another building where the bodies are brought in by hoist on a monorail, which removes them from highway trailers and carries them up to the second floor. Here the hoist places the individual bodies in a special carrier set in four casters. A tractor then pushes the load into one of two body lines, where the carrier engages a drag



Frame assemblies, suspended on monorails, are here shown moving to work stations.

chain conveyor which furnishes the forward movement.

The body then travels on the carriers several hundred feet to a point just behind the "body drop" station located on the floor below.

The carrier and body, after release at the discharge end of the drag chain conveyor, are pushed by tractor beneath the span of an overhead hoist. The body is then raised from the carrier and lowered into position on the chassis waiting on the floor below.

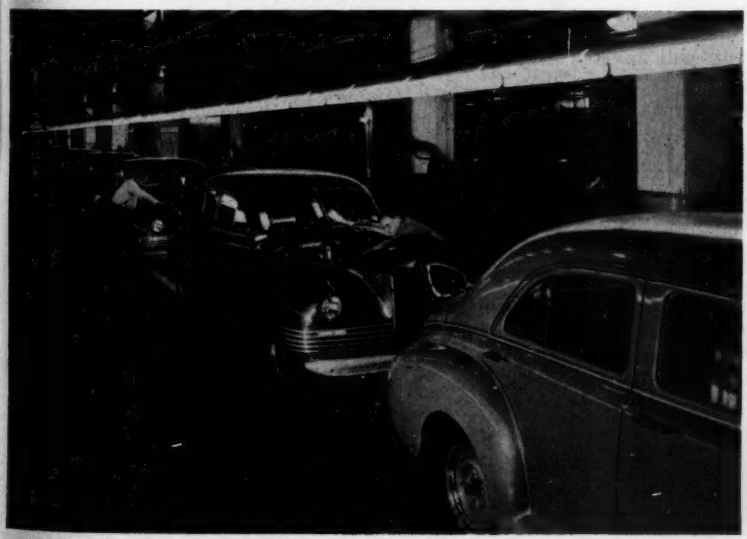
"Front End Drop"

Parts for the front end assembly on the second floor are spotted alongside a drag chain line. This parallels the opening over the two main assembly lines on the first floor. Platform lift trucks, moving box type skids, and overhead chain conveyors bring the parts to the assembly stations. Additional installations for overhead handling are now being made.

The assembly of the front end is made in a special type carrier, which is mounted on four casters and is propelled by a drag chain conveyor. The line is so laid out that it ends just behind and to one side of the "front end drop" stations. A hoist removes the completed front end and lowers it on the main assembly.

The Packard automobile is now on its way to final inspection.

New models move on one of two new final assembly lines. Front ends lowered from 2nd floor.



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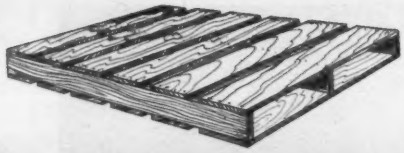
ON THE  PALLET

NEWS · VIEWS · TRENDS

DURING the first 6 months of 1944, industrial power trucks were being produced at an average rate per month more than 50% greater than the average yearly rate of production from the years 1936 to 1939 inclusive. The way in which this industry responded to the requirements of the Armed Services, prime contractors and essential industry, was:

1936, $6,500,000; 1937, $9,900,000; 1939, $7,300,000; 1941, $23,800,000; 1943, $103,200,000; 1944 (first six months), $67,800,000.

The figures are calculated from monthly reports of shipments submitted by manufacturers representing 100% of the industry.

The figures include both electric and gasoline engine driven trucks of the following general types: platform, lift platform, fork or ram trucks, crane trucks (designed principally for package material handling), towing tractors, motorized hand lift trucks and pneumatic tired fork trucks up to 15,000-lb. capacity, and straddle trucks (designed primarily for lumber handling).

TWENTY-THREE airlines recently created a "Shippers' Research Division." The primary duties of the new division at the outset are to reduce the possibility of loss and damage for air shippers and to create a clearing house for technical information on the speedy and safe delivery of airborne goods.

There is a good deal of research work still to be done on the effect of conditions encountered in air transportation and the study of packaging of materials which are classified as hazardous—inflammable, magnetic and radio-active materials and those producing toxic, noxious and corrosive fumes.

Packaging specifications and regulations are also anticipated. Present regulations are quite inadequate for such materials and considerable study will have to be done on the methods of safe packaging and handling. This program is particularly important at present because of the great increase in air cargo.

ACCORDING to the reports of various state industrial boards and labor departments as reported in the "Travelers Standard," there is a greater number of industrial injuries from handling materials (or, "mishandling" would be more accurate) than from any other cause. While these injuries are not serious in the main—they consist of cuts and lacerations, pinches, bruises, crushings and fractures, sprains and strains—most of them could be avoided through the use of simple inter-plant regulations or the wearing of proper safety clothing.

Considerable study has been made in the lifting of heavy objects which often results in sprains and strains. (The position assumed by a person when lifting, for example, is open to study on the basis of the stance used by professional weight lifters). And, the development of suitable mechanical lifting devices has been widely suggested to overcome this difficulty.

The article concludes by saying that the efficiency and high-speed quantity production of our large industrial plants are made possible to a great extent by the use of conveyors, cranes, derricks and trucks—to mention only a few of the mechanical handling appliances now in common use. However, manual methods will never be wholly displaced nor, probably, will the accidents associated with them be completely eliminated. Nevertheless, these accidents can be reduced in number.

ACCORDING to M. W. Heinritz, vice president in charge of the Storage Battery Division of Philco Corporation, the volume of industrial storage batteries shipped by the industry in 1945 was approximately $65,000,000.00, as compared with the all-time peak in 1944 of $70,000,000.00. It is estimated that without government and war purchases the industry will produce a volume of at least $60,000,000.00 in 1946.

Mr. Heinritz further states: "Electric industrial trucks are one of the fastest growing users of industrial batteries. These trucks, powered entirely by batteries, are rapidly coming into general use for more economical and faster handling of materials. This trend is expected to proceed at a much faster tempo in view of new war-developed techniques and the incentive all industry will have to achieve greater efficiency in its operations."

PRODUCTION cost savings become important, in most businesses, when they amount to as little as five or ten cents per ton on inbound materials. Small wonder that traffic managers, in cooperation with their raw material and production executives, are constantly searching for avenues that will lead to transportation cost savings, however small. An important saving often is found, for example, in perfect coordination of the flow of inbound materials with current production. Elimination of inventory costs, rehandling expenses, and rehandling damage mounts up to large savings in the course of a year.

Of course every inbound freight rate is also an outbound rate, and requires consideration from that point of view. Outbound shipments move in relatively small lots. Outbound finished products often move to points more favorably located with respect to competitors' origins, thus requiring absorption by the shipper of the adverse freight rate. The major characteristics of transportation costs on outbound finished products is that such cost determines the out-

(Turn to page 63)

Reduces Handling Costs!

By using the *Acme Uni-Pak* method, packages, semi-finished parts, or finished products are shipped and handled in one unit. The use of *Acme Steelstrapping* alone or in combination with a skid or pallet makes this method possible. Acme Uni-Pak lowers handling costs for you and your customers and increases shipping protection.

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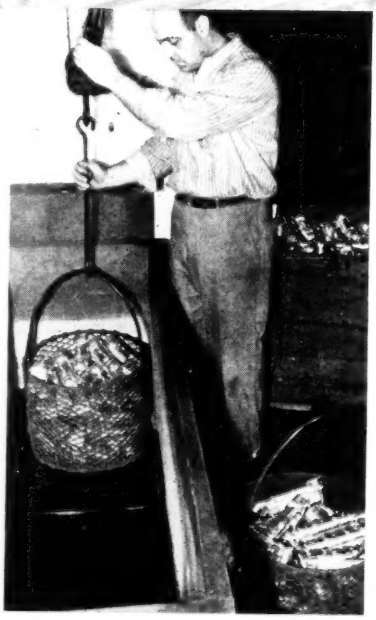
THE *Big Time* FOR THE LITTLE ONES...

The assembly line that makes Dad's automobile is not much different, in principle, from the progressive assembly line that makes Junior's miniature train: how mechanical handling devices contribute to a high level of production at a leading toy manufacturing plant.

ASSEMBLY lines are not reserved for automobiles, washing machines, typewriters, or other prime utilities. Because of the economies effected, such lines have been installed, even before the war, in plants making toys on a production basis.

An outstanding example of up-to-date practice in toy assembly is the one now in full swing at the Lionel Corporation plant, Irvington, N. J., producing miniature locomotives and other toy size rolling stock. Belt conveyors, various types of tote boxes and other handling devices help speed the product to completion, testing and then to packaging. While the mechanized assembly expedites the operation, it at the same time contributes, in conjunction with the best tools and fixtures, to the required quality performance of the finished product. The accompanying photos show some of the devices used as well as several stations along the line.



Baskets of locomotive boilers are degreased with aid of hoist. Note caster type tote box.

Spray Booth Feature

The unpainted castings are delivered to the finishing department in tote boxes, some of which are mounted on casters. The parts go first to a degreaser where they are transferred to metal baskets. The baskets are lifted individually by an electric overhead hoist and then deposited into the degreasing solution. Upon withdrawal, the loads are transferred to the Bonderizing room, where the units are trans-

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THE *Big Time* FOR THE LITTLE ONES...

The assembly line for [illegible] Dad's automobile is [illegible] different in principle, from the progressive assembly line that makes Junior's miniature train. Now we [illegible] chanical handling devices [illegible] tribute to a high level of production at a leading toy manufacturing plant.

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XUM

Hoist on looped monorail dips load of castings into Bonderite tank. Treated castings, transferred to trays, then move through oven, left.

This is the handy turntable, back of spray booth, on which castings enter and leave spraying operation. View is through vertical door.

ferred to oblong baskets that fit the tanks in the Bonderizing line. An electric hoist operating on a looped monorail then unloads the baskets.

Upon removal, the castings are placed on wire mesh trays which are attached to a chain conveyor that carries the trays through a drying oven. The units are then ready for painting.

This operation is done in spray booths of fairly conventional type, with this exception: a part of the booth's rear wall constitutes a door which is so arranged that it can be lifted vertically by the operator (by means of a lever) when he finishes a tray of parts. The trays are open frames, or are made from wire mesh and are supported on turntables at each end of a beam that is pivoted at its center, the pivot fitting into a slot in the lifting door.

Except when being moved, the turntable at one end of the beam is near the center of the spray booth (which, at the opposite end, is outside of the back of the booth in the loading and unloading position). During the spraying, the tray is swung around on its turntable so that the surfaces of all the castings are covered. When the operation is completed the operator hangs up the gun and raises the door. The beam is then swung around, end for end. This carries the sprayed parts to the unloading station and brings a newly loaded tray into the booth.

While the new tray load is sprayed, a helper behind the booth lifts off the tray previously sprayed and replaces it with a tray of unfinished parts. The tray with the sprayed parts is deposited on a belt conveyor paralleling the row of booths and running along one side of the baking ovens. Thus the helper fills the trays with unpainted castings, shifts trays on the spray booth turntable and removes sprayed parts. This makes it possible for the spray operator to keep trays of sprayed castings moving toward the oven loading station at the end of the belt conveyor.

Here, an operator transfers the trays to a chain conveyor that carries the loads through the tunnel oven. At its unloading end, the trays are placed on another belt conveyor on which the parts are inspected (while cooling) and any necessary touchup is done. The parts then move to the assembly.

Thus, from the time the castings leave the machining department until they emerge ready for the assembly, they move almost continuously in tote boxes, hoist-operated baskets and on conveyors. This handling makes for economy in over-all costs. Similar economies are indicated in the assembly operations. The following paragraphs describe one of the lines on which locomotives are assembled, and one special sub-assembly setup that is neatly accomplished on a turntable or dial-like machine built for handling this particular unit.

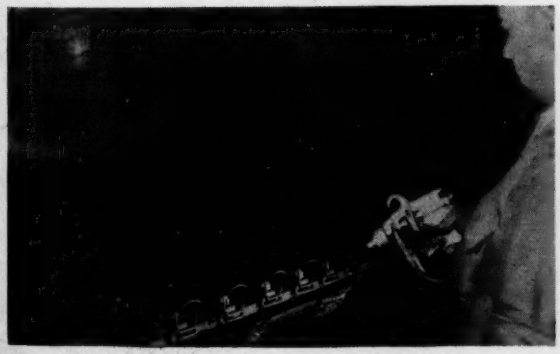
Making a Locomotive for Junior

Finished parts to be assembled are received in racks or tote boxes, the former being used chiefly for the largest subassemblies which require care in handling since they are already painted. Other parts are stampings, fastenings, electrical components, etc.

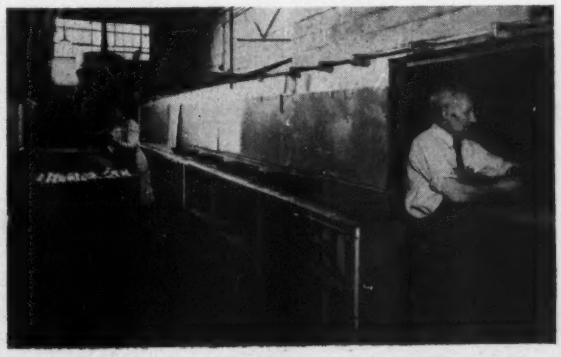
At the start of the locomotive belt line, the opening for the "headlight" is made and light-reflecting material inserted; at an adjacent side bench this operation is com-

(Turn to page 52)

Closeup of tray on turntable inside spray booth. Because parts are turned on tray during spraying, all surfaces are uniformly covered.



Back of spray booths, left. Woman operator places trays of sprayed parts on belt line, right. Man transfers them to line moving in oven.



Well Founded Handling Pr

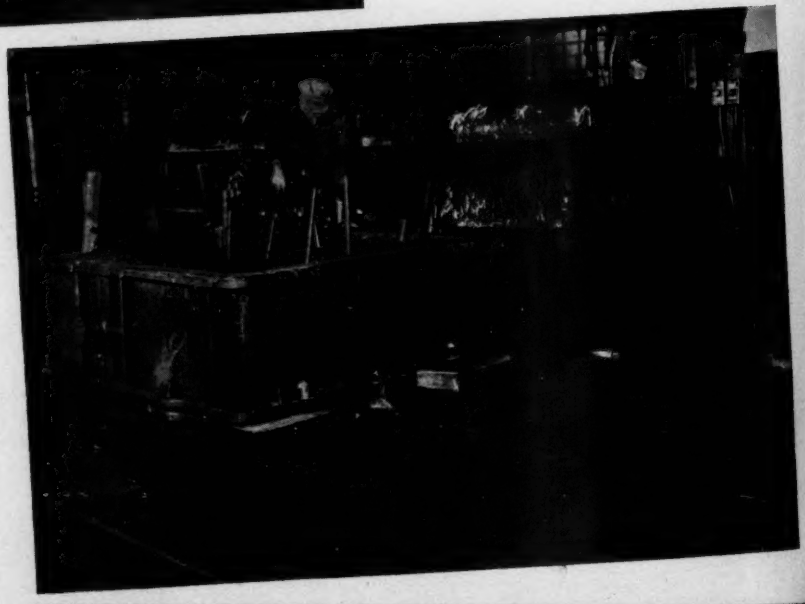
Cranes in pattern storage, left, have cab and pendant control; no crane follower.

Here is a foundry with a well-engineered application of the loop principle of production flow; with mechanical devices that move heavy loads without rehandling, and return all reusable materials to their starting point in the normal course of production.

FOUR types of machine tool castings are produced in the four production units of the Cincinnati Milling Machine Company. The supervisor of each of these self-contained foundry units (within one building) is responsible for the entire performance of his division, beginning with pattern storage and ending with shipping. This undivided responsibility results in coordinated movement of material and a balanced flow. The subject of this article is the 4-A production unit.

STORAGE SPACE ELIMINATED

The non-productive handling of sand, flasks, coreboxes, patterns, cores and castings was considerably reduced with the aid of many mechanical handling devices. The use of a large number of cranes, traveling monorail hoists and roller conveyors permits all bulk materials and containers to be routed the shortest possible distance and returned in cycles to the starting points. In addition, a saving in space has also resulted—space that would otherwise be necessary for temporary storage of flasks, coreboxes, etc. And since the product



Conveyor with walking beam moves flasked patterns through molding line, above. Five such conveyor hook-ups in tandem are used.

Flow sheet of 4-A foundry unit, right, illustrates principle of looped production flow, returning reusable materials to start of line.

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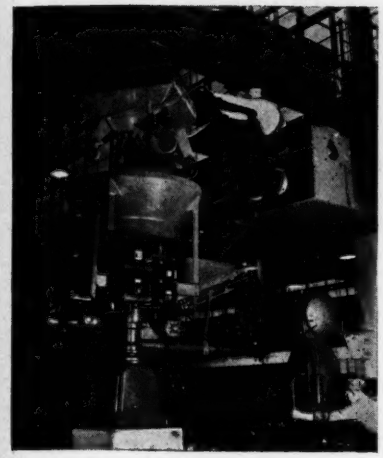
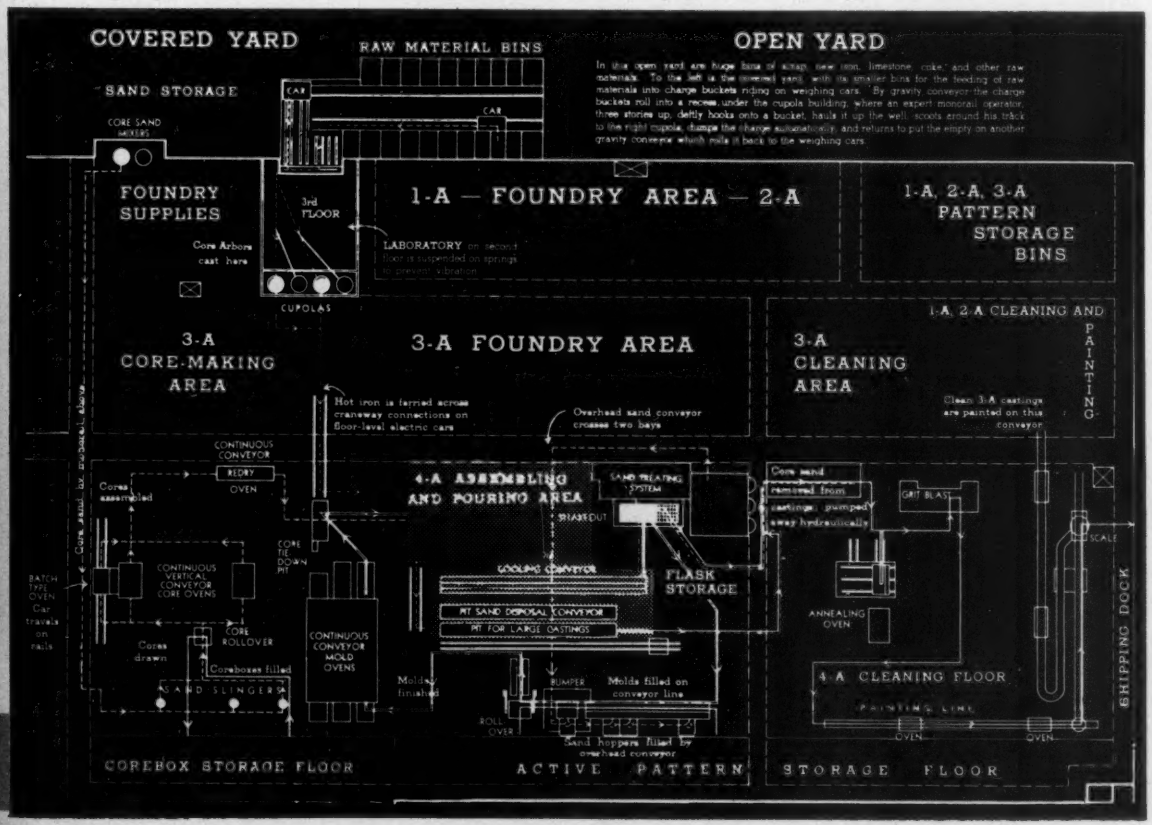


Crane with cab unit, left, carries sand truck to slinger in core line. Lever opens bottom of truck and releases the sand.

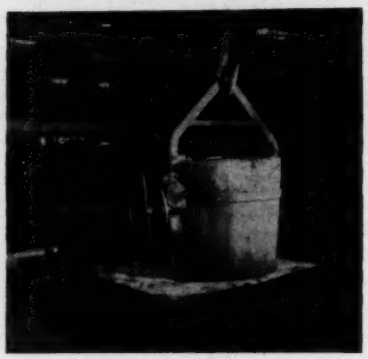
Bracket cranes, top, traveling under span of larger cranes, handle material for pit; carry patterns, set cores, perform positioning jobs.

is usually on the move—in some cases even while cooling—no product storage spaces are needed.

It should be noted that the absence of intermediate storage points in the 4-A molding unit, the largest, would not be possible without the use of standard flasks—seven sizes. Their use (instead of special flasks) coordinates the cycle flow of flasks and patterns so that they join at the proper time, without necessitating large flask storage areas or causing waiting time. Most foundries with a diversified production are characterized by a flask storage yard, often as large in area as the foundry itself. At Cincinnati Milling, all the flasks are in the



production cycle at all times. The scheduling and balancing of iron and sand delivery, the interchangeability of pattern mounting, and



Ladles are placed on transfercar, which moves them across center aisle within range of crane.

frequently even the design of the casting, are predicated on the existing standard flask sizes. They are standard containers in which patterns, sand, castings and cores flow through their cycles at controlled speed.

The 4-A production unit produces the largest castings. The layout, shown on these pages, is a good example of the loop principle of production flow. The 4-A unit has four zones of operation, the mold making, the core making, the iron making, and the cleaning, finishing and shipping. This arrangement and division of production processes into separate zones permits complete cycles of operations to be performed simultaneously.

Molding Line Flow

The production flow in the large molding line begins with the movement of patterns from the pattern storage area. (Flasks which have completed the cycle and have left the shakeout are brought back to the head of the moulding line by gravity roller conveyor.) In the adjacent pattern storage area are two cab-controlled monorail cranes. These cabs can be lowered to floor level, permitting one man to make his own hookup and eliminating a crane follower. The patterns are picked up by a chain sling and the crane deposits them on a roller conveyor, which transfers them across the bay line to the flask-up position. The flasked patterns are moved from this short conveyor by another crane and placed on the mold make-up line.

Split sections of heavy roller conveyors, equipped with air-operated walking beams and pusher dogs in the center, convey the flasked patterns through the molding line. There are five such conveyor units in tandem that make up the platform for this line. The flasks stop at a pantograph "riddling" machine which spreads an even layer of sand over the whole pattern (following the insertion of the chills and gaggers). The next stop is at one of two flask fillers, which feed sand from overhead hoppers. A crane then moves the sand-filled flasks to the "bumper."

From here, another short move by crane brings the tightly rammed flasks to a rollover machine of 20-ton capacity, where the pattern is withdrawn by lowering it. A roller conveyor continues to move the mold through production, while the pattern returns on another line to the storage area. Here the monorail crane stores the pattern in its place or returns it to the head of the makeup line. The movement of the pattern just described is a good example of the loop principle of production flow.

Molds, picked up by crane from the roller conveyor, stop at the finishing area to be touched up and faced with graphite refractory material. A crane then lifts them to one of three conveyors that pass through the mold drying ovens, which enable the foundry to operate at different levels of capacity. Smaller flasks, for example, can be put through one oven at a faster pace while the larger flasks are more slowly conveyed through another. As can be seen from the layout, the ovens are so located that as the molds move through them they progress from one bay to another. Another feature is that the ovens are "piped up" for either oil or gas, obviating the dependence on one fuel supply.

After drying, the molds are ready to receive the cores and be closed up and poured. The mold oven conveyor brings them into another bay where the copes are removed by crane to a tie-down pit and the drags are placed in an assembly area. After assembly of cores into the molds, the latter are closed by placing the cope on the drag with the aid of a crane.

A pit is used for molding castings that exceed the standard flask sizes, an operation in which bracket cranes handle the material. These bracket cranes travel beneath the

Cone-bottom buckets carry raw material to cupola. Scale in transfer car weighs material.

span of the larger cranes that service the bay. They carry patterns, set cores and, after the pit mold has been completed, move tie-down weights into position. A motive type side slinger travels on rails parallel to each pit and fills it with sand. The bracket cranes empty the pits of spent sand, using a bucket to dump it through a grate on a belt conveyor (part of the sand reclamation system), which runs beneath the floor level. The devices make for easy disposal and movement of material.

Core Line Flow

In the core making line, coreboxes travel as short a route as the patterns in the molding line. The monorail crane with the "raise and lower" cab here, too, enables one man to make the hook-up. The coreboxes are carried by crane from storage and set on a roller conveyor which moves them to another bay where they can be picked up by an overhead traveling crane.

Here the boxes are removed and placed beneath one of three sand slingers, whose hoppers are filled with the aid of this crane. The core sand is brought in from outside the building from the mixers shown in the layout. Buckets equipped with casters carry the sand and are moved to the core making area by monorail cab units. The filled coreboxes are then moved by roller conveyor to a rollover machine where they are inverted and drawn away from the packed sand cores. The empty corebox is put in a gravity roller conveyor.

This either returns the corebox to the storage area or carries it back beneath the overhead crane for transfer to the core making station, thus completing another loop flow.

A transfer table set in tracks (sunk level with the floor) conveys the cores on plates away from the rollover machine, to be finished and transferred to trays of the stacking type. The trays are set by crane on two roller tables which support the runners beneath the trays and serve as an oven loading conveyor. At the discharge end of the vertical oven, located in another bay, are similar roller tables used for unloading. The vertical oven is about 60 feet high and equipped with a pendant type elevator.

The dried cores are picked up by crane and positioned for assembly, while the core plates and carriers are returned by conveyors to the rollover machine. Since there may be as many as 50 cores in a casting, the cores for each casting are assembled and then blackened. They are next placed by crane upon a continuous conveyor which carries them through another drying oven.

At the discharge end of this oven, the cores meet the molds emerging from the mold drying oven. While the cores are carried to the copes by crane, skids and platform lift trucks move them to the drags. This completes the core making cycle. When the copes and drags have been assembled by crane, the mold making cycle is complete, and the molds are now ready for pouring.

Heavy-Duty Handling Aids

Ladles up to 10-ton capacity are used in the pouring of the large A-A castings. As molten iron cascades from the cupola spout, it pours first into an auxiliary mixing ladle, which serves as a reservoir permitting a constant flow from the cupola. From these mixing ladles are filled the crane ladles which, during the filling operation, are automatically weighed on a traveling scale. The crane ladles are put on an electric transfer car, which moves them within range of the next overhead crane. This carries them to the molds for the pouring operation. (For extra large castings, another transfer is neces-

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By Hughes-Keenan

sary to reach the next bay and mold pit.)

The poured mold is then placed on the tail end of a cooling (roller

From transfer car, bucket with charge moves beneath the span of monorail cab unit.

type) conveyor and is removed by crane to a mold shakeout machine. After the shakeout, the flasks are placed by crane on another conveyor which carries them back to the small flask storage area at the beginning of the mold make-up. This completes the flask cycle. (Details on the sand handling system are given in later paragraphs.)

Casting Flow Line

This line starts at the shakeout from which the castings are removed by crane and placed in a cooling area. After cooling, the gates and risers are removed and the casting is placed in the core blast booths by overhead crane. (Sliding doors on top of the booths are closed and sand and water under 1,200 pounds of pressure and at a velocity of 450 ft. per second are played upon the casting.) The core sand and water drop through grates and are pumped to an underground point 400 ft. away for reclamation.

Depending on the particular operation, the castings are then moved from the core digging room or annealing oven by pendant crane to the grit blast booths. From here the product is again moved by crane to a roller conveyor leading to the "finish cleaning" area, where chipping, grinding and inspection take place.

Now ready for painting, the casting is placed by crane on a wooden pallet which rides a roller conveyor. On this line the product passes through a down-draft spray booth. It is next carried through a drying oven and other stations. A turntable then routes the casting onto another roller conveyor. This line, equipped with a walking beam and pusher dogs, carries the casting through several more cleaning and finishing operations. At the end of this conveyor is a scale from which the casting is removed by crane to a nearby flat car for shipment. This completes the casting cycle.

Sand Distribution, Reclamation

Distribution of bulk material throughout the plant is by an overhead monorail and cab-controlled carrier system. It carries replenishments from the sand or clay storage pits in buckets to the mullers. Since the hoppers are above the level of the main monorail system, the carriers enter upon a special section of track which is then elevated to the necessary height for passing above the hoppers. An overhead belt conveyor system carries the mixed sand to the mold makeup stations.

Recovery of the mold sand after shakeout operations begins with a belt conveyor which passes beneath the grates of the shakeout booths. This line carries the material over magnetic pulleys that remove iron particles. By means of several different conveyor lines, one of them a flight conveyor, the sand passes through several screens. After cleaning, the material is carried by the system to the dry sand bins behind the mullers previously mentioned.

The sand is mixed with blending materials and then discharged into sand bins below floor level. From here the material is conveyed by a sand distribution system. It passes far above the uppermost craneways, crosses two bays and returns to the hoppers of the flask fillers along the molding line.

Core sand mixers, adjacent to the raw material storage area in the covered yard, fill steel buckets which are carried by the monorail system beneath the span of a traveling crane. The latter loads the hoppers of the core sand slingers.

Recovery of the core sand, which is blasted out in the core dig booths, is by means of a hydraulically operated sand reclamation system. After being pumped to a cleaning station, the sand is scrubbed, washed and classified. To get the material from the cleaning station to the core sand mixers means moving it some 800 feet. Here is how excess handling was avoided. The centrifuge machine is located near the point of use at the core sand mixers, instead of at the distant cleaning station. And an installation was made for pumping the wet sand hydraulically to the centrifuge. This arrangement avoided the necessity of moving

Top rim of charge bucket will be set by hoist on wishbone inside open end of cupola, shown at left of photo. The lowering of the cone then spills the material.

the dry product over a considerable distance.

Continuous Flow of Raw Materials

Tons upon tons of pig iron, steel rails, scrap cast iron, limestone and coke are charged into the four cupolas. These raw materials are stored in sloping bins by a 10-ton crane using either a lifting magnet or clam-shell bucket, depending on the nature of the material. Charges are made up in cone-bottom buckets which have a mushroom stem through the center and an outer rim around the top edge. They are moved past the bins by a motor-operated transfer car.

A scale on the transfer car weighs the ingredients as they are placed in the buckets. Since the bed of the transfer car is made up of rollers, the loaded buckets can be pushed off on a gravity roller conveyor. The latter carries the load to a recess below the path of a monorail cab unit. This unit lifts the buckets to the height of the third floor and loads cupolas.

While more than one loaded bucket could be put on the roller conveyor, only one at a time can enter the recess because a hydraulic brake locks the rollers behind it. After removal by the charging monorail cab unit the brake is released and the next bucket slides into place.

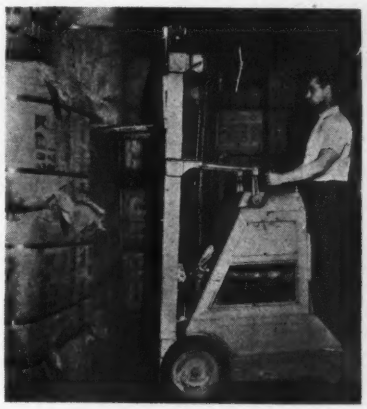
To remove the bucket from the recess, the charging cab unit lowers a grab hook over the mushroom head and hoists the load to the cupola charging floor. The load is discharged by resting the bucket rim on a "wishbone" built in the opening of the cupola. As the hoist lowers the stem holding the cone-shaped bottom, the contents spill out.

The empty bucket is removed by the charging cab unit and lowered to another gravity roller conveyor. This inclines toward the path of the electric transfer car which receives the empties, thus making the loading and unloading a continuous operation.

The advanced handling methods which were engineered into the flow and layout of the foundry have provided a flexibility that has made material handling operations amply adequate for every product scheduled through the plant.

NOT LIKE THIS

THESE baled goods are stacked incorrectly, because there are no dunnage strips separating the individual units. As a result, the truck



operator has difficulty in unstacking the bales and cannot avoid damaging the covers. The use of 2" x 4" dunnage between bales corrected this situation and provided the necessary clearance for the free entry of the forks.—*Courtesy, Midtown Warehouse, Inc., New York City.*

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When you are using millions of empty bottles, the pressure's on to . . .

Fill 'Em Up

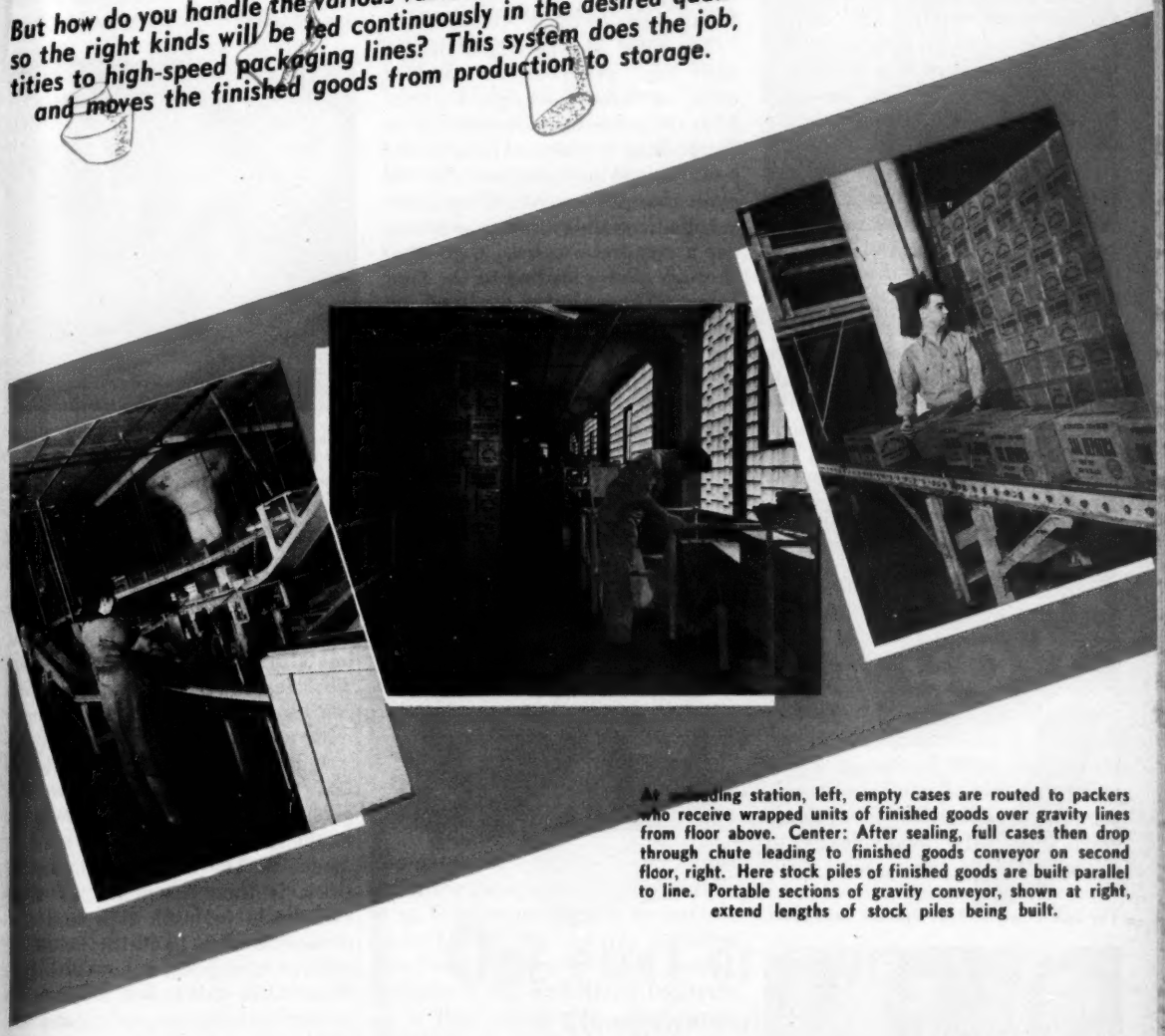
BY EDWARD W. LOVE
Production Manager
Bristol-Myers Company

IN DRUG and specialty stores across the country you see the jars and tubes and bottles—millions of them—that contain our company's products. They are packaged on high-speed machines each of which turns out hundreds of units every minute. Magazine articles usually deal with the packaging aspect of the *finished* goods, but how are the *empty* bottles and jars handled and moved to production? That is the aspect this article attempts to cover, including the transporting of the finished goods from processing. This is an important part of the whole picture, for the supply of the millions of empty units must be maintained in a constant flow to the packaging lines. In other words, the handling of the empties must be as nearly mechanized as the advanced high production methods themselves.

The system moves empty glass goods from freight car, left, to point of use on third floor. More sections of conveyor are added as unloading progresses. Center: Main distribution point in glass storage area, from which branch lines extended to the various stock piles. Right: Lines converge beyond storage area on inclined belt conveyor, which carries cases to overhead distribution point. From here glass goods are routed to unloading stations that serve production.

To assure a constant flow of empty glass goods, our company uses a specially designed conveyor system. Over its various lines the jars and bottles move to production, and the finished goods from

But how do you handle the various varieties and sizes of empties so the right kinds will be fed continuously in the desired quantities to high-speed packaging lines? This system does the job, and moves the finished goods from production to storage.



At unloading station, left, empty cases are routed to packers who receive wrapped units of finished goods over gravity lines from floor above. Center: After sealing, full cases then drop through chute leading to finished goods conveyor on second floor, right. Here stock piles of finished goods are built parallel to line. Portable sections of gravity conveyor, shown at right, extend lengths of stock piles being built.

production to the stacks in the warehouse.

From Cars to Production

The conveyor line starts in the freight cars, each of which is loaded with thousands of cases of glass goods. This part of the system is made up of short sections of gravity and power conveyor which discharge (after passing through a wall opening) on the main line that transports the cases up to the third-floor glass storage area. (The freight car dock is on the second-floor level of the factory building.) As the unloading of the cars progresses, more conveyor sections are added for maximum convenience of the operators.

On the third floor, the inclined powered belt conveyor delivers the cases to a central distribution point, from which four parallel gravity lines branch out to the storage area. Each branch line is equipped with a hinged gate which can be quickly connected (by lowering it) to the central distribution point. The cases are routed (according to product and available space) over these lines to their respective stock piles. The latter are built parallel and adjacent to the gravity conveyors. Thus the system also enables us to classify the cases by products as they arrive from the freight cars.

Here is how the empties are routed to the production department, which is located on the floor above. Immediately beyond the storage area, the four gravity lines converge on one line which discharges on a powered belt. The latter inclines to an overhead powered roller section (another central distribution point), from which the cases are distributed by product and size to the various unloading stations. Here the bottles are removed from the cases ("unloaded") and sent by bottle elevator to the production floor for filling and processing.

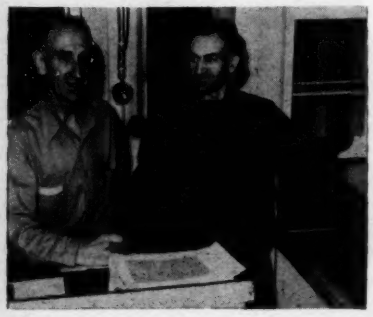
The following describes further details of routing the empties to the various unloading points. In the glass storage area there are electric switches which control gates on the overhead powered section, from which lines branch off to several unloading stations. When, for example, an unloading operator

needs a supply of small size Sal Hepatica bottles, a light flashes automatically on an annunciator, installed near the electric switch panel, thus signalling the need for more glass goods of that particular size and kind. *(See "Mechanically Speaking" for an explanation of the annunciator installation.—Ed.)* The stockman then sends additional cases over the line, and throws the switch controlling that particular gate, thus diverting the cases to the correct line from the overhead distribution point.

Question: Might it not be possible to route the incoming cases directly from the cars to the lines feeding the unloading stations, thus saving the handling at present necessary in the glass storage department? This is feasible—and occasionally we can do it—but only to a limited extent. Here's why.

The glass goods arriving from the cars must necessarily be of the size and for the products needed at the unloading stations. Hence such cases can by-pass the glass storage area only when these two factors coincide. Aside from this, however, the reserve stock in storage represents a margin of safety because it provides a full selection of glass goods instantly available when needed. This in turn assures flexi-

The bulk order method: Operator calls cases.



bility for production in the event a packaging line should suddenly be changed from one size to another.

Moving Finished Goods

Meantime, what happens to the empty cartons after the glass containers have been removed from them by the unloading operators? Each operator places the empty cartons on a conveyor (adjacent to her), which carries them to the case packers. The same corrugated cartons that originally contained the empty glass are thus used for packing the finished products.

The filled and packaged bottles and jars, wrapped in standard units, come down over gravity lines from the production department to the packing stations. After the automatic packing operation, the full cases pass successively through an automatic sealing machine and under a compression belt, then drop through chutes leading to the floor below. These chutes discharge on gravity conveyor sections which are connected to an overhead power belt that runs the full length (about 300 ft.) of the finished stock storage area on the second floor.

Installed at pre-selected points

Clerks place called number on belt line.

along this belt line are take-off chutes, which discharge on portable sections of gravity conveyor. These sections extend the full length (about 40 ft.) of two bays and are arranged parallel to the stockpiles being built. When the limit of a new stockpile has been reached the conveyor sections (and chutes) are moved back to the start of the area. Since the latter has in the meantime been freed by shipments, the department is enabled to move the older stocks first.

The carrying surface of the finished goods conveyor is divided into two equal parts by a guide rod running down its center. This permits two different sizes, or two different products, to be routed over the belt simultaneously. Since gates are set at any point where the merchandise is to be shunted off the line, any take-off chute along the line of travel can be bypassed.

"Bulk" Order Method

Visitors to the plant are usually interested in the handling of goods for pickup deliveries by truck (as distinct from carlot shipments to our warehouses). Previously, these

Cases are stencilled, then move out to trucks.

case orders were assembled individually on small trucks or platforms, and each order was then placed on the loading dock or in the shipping room. This "individualized" method of handling not only required much space and time, but also gave trouble in checking. To streamline this operation, the company adopted the bulk handling method. Here is how it works.

1. The pieces (cases) of each size and product are totaled for any given day on the afternoon prior to the day when shipment is to be made. 2. The required amount of stock is then assembled in solid skid loads (of each type and size of merchandise), and the loads are spotted alongside a powered belt line. While this is being done, the correct stencils for each order are being collated. 3. The orders are then broken down according to carrier. 4. The collated orders and stencils are turned over to an order caller, who is positioned at the head of the live belt conveyor during shipment. 5. He calls out the number of pieces required for each order, and the stock clerks place the number and kinds of cases from the skid loads on the belt line. 6. The caller passes the stencils to the stenciling operator, stationed to one side near the head of the line, who stencils each case as it arrives. 7. The stenciled cases are checked against the order by a checker for quantity, size and product, and the goods then move out through a wall opening over short power and gravity sections into the trucks.

Improvements Are Planned

This describes how a continuous supply of empties is maintained to production and how, with equal facility, the finished goods are moved to the warehouse floor. The various operations — unloading, stacking and routing of empty glass goods, packing and sealing—are effectively coordinated by means of this system, making possible the movement of a considerable daily quantity with smoothness and precision.

However, we are not entirely satisfied with some aspects of our present methods. This applies particularly to the raw material arriving at the plant and the handling of finished stock from the warehouse to the cars. We are at present making a survey with a view to further streamlining the over-all methods in order to effect additional handling economies.

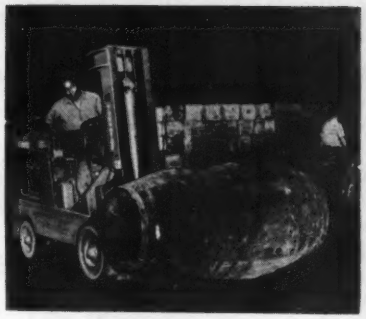
Mechanically Speaking

The take-off chutes on the second-floor finished stock storage area ride on tracks that are mounted on the underside of the supporting framework of the power belt. Equipped with roller bearing connections, the chutes can be moved along the track to any desired point with ease.

Each conveyor line feeding an unloading station is equipped with a limit switch, which is installed at a point of from 10 to 20 feet back of the unloading point. The specific distance in each case is determined by the stock requirements—that is, the frequency with which the stock is used—as well as the size of the unit. For example, considerably more cases of a "small" size bottle can be placed on a given length of line than of a large size. When the line is filled, the cases depress the limit switch, which in turn shuts off an indicating light on the annunciator in the storage area. As soon as the cases have been used up beyond this point, the switch is released, thus making contact and flashing the light on the annunciator—the signal for the stockman to send more cases. Since the limit switch is installed a certain number of feet from the unloading station, the girl still has work ahead to keep her busy in the event additional cases are not sent immediately.

FROM OLIVES TO NUTS

Handling a wide variety of commodities, ranging from barrels of olives to bags of nuts (including crated automobiles weighing up to 6,000 lbs. each), is part of the daily handling job at the Apex Transportation Co., Philadelphia. The adoption of a modern mechanical handling system has enabled the company to increase production by 400 per cent, using one-half the former manpower.



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Material Handling Equipment — Engineered Hydraulic Devices

THE FLOW Class Room this month concerns itself with safety. Presented here is a U. S. Department of Labor, Division of Labor Standards, discussion on handling materials. This material should be in the hands of every superintendent and personnel man concerned with training and education.

1. In most industries the handling of materials, articles, and equipment is the chief source of injuries. Every type of material and every article handled in or about the plant must be studied, and consideration given to tonnages involved, character of material or article, unloading from car or truck, storing, means of handling in process, preparing for shipment, shipping. The handling of incidental supplies and equipment should also be looked into, for at times this work will involve considerable hazard.

The following list of operations commonly involved and means of meeting the hazards incident to them, will be suggestive:

Operation, Hazard, or Injury

2. *Incoming cars or trucks.* Struck by train, car or truck.

3. *Unloading cars or trucks.* Torn, pinched, or crushed hands and feet, bruises, strains, falls, injury to health from dust fumes or chemicals.

Preventive Measure

Proper clearances between sidings and tracks and fixed structures. Gates, warning signal or signs, guard rails. Under (or over) passes. Supervision of car movements. Proper location of trafficways and doors to buildings. Adequate yard lighting, elimination of tripping hazards. These measures apply for motor traffic except that roads may quite easily be relocated and truck and car operators may be on plant pay roll and thus under the direct control of the plant executives. Proper tools and equipment, careful training and supervision of men in safe methods of work, personal protective equipment, adequate lighting.

4. *Emptying and cleaning tank cars.* Suffocation or poisoning on entering tanks, burns from acid drips, falls from cars, explosion of flamable gases, electric shock from extension cords.

Preventive Measure

Testing of air in cars, steaming out, washing out or ventilation of cars, use of fresh air helmets, use of life line and watcher outside car, training, supervision, proper ladders, platforms and tools, and equipment, safeguarded extension cords and lights, protective clothing.

5. *Opening baled, crated or barrelled material.* Cuts and abrasions from sharp edges, nail wounds, strains from lifting, tool wounds.

Preventive Measure

Adequate space for work, proper tools, training, supervision, housekeeping and order, hand, foot and leg protection, lighting.

6. *Piling materials.* Falling materials, strains from lifting, falls, foot injuries.

Preventive Measure

Equipment to aid piling, methods worked out to suit materials and conditions, training in proper ways to lift and to pile materials, adequate storage space, orderliness, lighting.

7. *Transporting materials and articles through the process.* Struck by trucks, hand pinched, torn or bruised under or between articles, articles falling on feet, falls, over loose articles, strains, getting caught by powered conveying machinery.

Preventive Measure

Planned and routed traffic. clear aisles, trained power vehicle operators, hand truck of proper type, adequate spaces for placing at machines or other stations, housekeeping and order, complete guarding of all hazardous moving parts. Good maintenance of equipment and floors.

8. *Preparing for shipment.* Strains, tool injuries, falls.

Preventive Measure

Order, training, proper equipment, adequate space, supervision.

9. *Handling acids, caustics, hazardous substances, volatiles.* Burns, dermatoses, eye injuries, inhalation of toxic fumes.

Preventive Measure

Special equipment for handling the substances personal, protective equipment, specially trained men, testing for susceptible individuals.

10. *Handling stock or articles at machines or processes.* Abrasions, cuts, bruises and sprains of hands, and arms, slivers in hands and arms, foot injuries, dermatoses (chiefly in chemical and allied industries), eye injuries from flying particles, burns (welding or forging).

Preventive Measure

Gloves, wrist and hand leathers, aprons, safety shoes, goggles, reduce handling by layout of machines, processes and by motion study, substitute less toxic substances, special handling methods suited to specific conditions.

11. The above list could be expanded almost indefinitely, simply by adding detail. In many plants

so many problems are involved that no inspector can hope to cover them all on any one inspection. In each plant he covers, however, he can look for the more obvious hazards. If he finds evidence of correctible hazards in the handling of materials, he can present the evidence to the management in as definite a form as possible.

This phase of plant operation is often neglected, yet often a considerable part of the pay roll is spent in handling materials, and weaknesses here may seriously decrease the efficiency of production itself. The most efficient methods are usually safest. When the inspector finds unsafe methods he can usually be sure that introduction of the proper methods will reduce not only the hazard but the cost.

12. Often an unsafe condition arises simply through the growth of a plant or through changes in products or processes. The management gets so used to the old methods that it accepts their limitations without question. If the inspector can bring in a fresh viewpoint and get the management to examine its methods critically, it will usually find ways to improve conditions.

13. Symptoms that indicate bad handling methods include:

a. *Confusion and lack of order.* The lay-out of processes and the arrangement of machines should be such that materials and stock are carried ahead in direct lines, and not back and forth or with paths crossing and intermingling.

b. *Handling by hand.* Lifting, carrying and placing by hand should be limited to machine feeding on short runs, special operations on light parts or light stock, and to small volumes of supplies or of special material.

c. *Handling too heavy objects by hand truck.* While such materials as barreled pigment, filled drums, etc., weighing a half-ton or more each *can* be handled by hand truck, the hazard rises rapidly with the weight above a few hundred pounds. Such products are generally best handled by powered trucks or other lifting and conveying equipment especially suited to the purpose.

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Help yourself and your employees' "aching backs" by using Rapid-Wheel Gravity Conveyor. Now available in standard 5' and 10' sections.

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OFFICES IN PRINCIPAL CITIES

Manufacturers of

STEEL FORGED CASTERS · TRUCKS · CONVEYORS · POWER BOOSTERS

The Rapids-Standard Co., Inc.

Sales Division—377 Peoples National Bank Bldg., Grand Rapids 2, Michigan

d. *Unmarked or narrow and crowded traffic aisles and material storage space.* For dense or powered traffic, aisles should be at least three feet wider than twice the width of the vehicles used. Storage spaces for materials, stocks and parts on production floors should be clearly marked off, properly located in relation to the machines or operations and aisles and not encroached upon for other purposes.

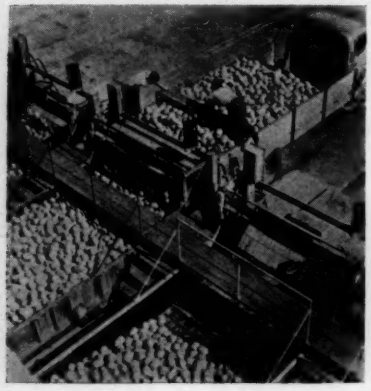
e. *Overloaded or carelessly loaded box trucks, carriers, etc.* These conditions indicate poor supervision and poorly trained and careless workmen.

f. *Bad maintenance.* This includes such details as wobbly truck wheels, rickety truck bodies, noisy powered equipment, worn and uneven floors, worn crane cables, stretched and worn chains, uneven plant railway tracks, worn or broken tools.

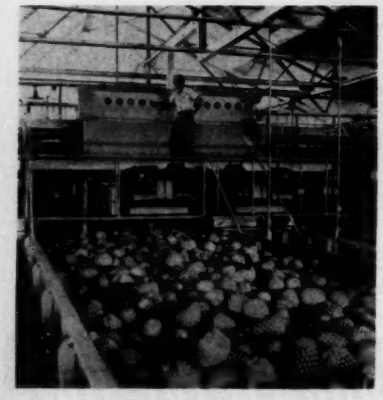
14. Some may feel that these things are of little importance in a small establishment. But size of plant is not the important factor. Bad handling means high cost as well as high hazard. Small establishments need every possible economy. If their managements (usually an over-worked part-owner superintendent) study the handling (and allied) problems with care, they can usually make improvements that will reduce both costs and accident hazards.

WHEN IT'S PINEAPPLE TIME IN HAWAII

THE Maui Pineapple Co., Ltd. has installed a system of portable and feeder conveyors for the transfer of the ripe fruit from the field to the canning machines.



Field trucks are supplied with portable conveyors for easy loading without crates. At the cannery, fourteen feeder conveyors, set up at right angles to the main conveyor, unload the pineapple from the trucks. Cement tire guides



align the trucks with the individual conveyors and the unloading dock is constructed to fit the truck end closely. A short ramp rolls the fruit easily down to the moving belt.

Inside the plant, on a platform above the feeders, there is a control panel. The operator can run independently any one of the 14 feeders at any desired speed. When the main conveyor has a full load, the feeders are run at very low speeds or some of them are stopped completely.

At the dock-end of the feeders, there is another set of controls which permits the truck driver to regulate his unloading by operating the belt so as to take away the full load.

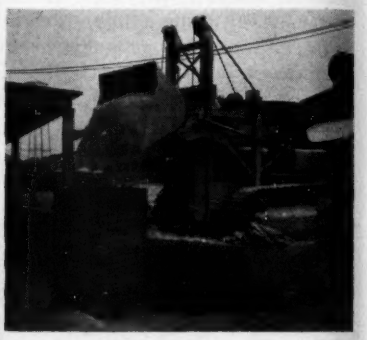
Under the old practice, fruit was gathered in picking crates which were loaded by hand onto the trucks. When unloading by hand,

the dumping of crates resulted in some bruised fruit. The installation described above eliminated this hand loading and unloading. And since crates were completely eliminated from the handling operation, considerable additional savings have resulted, according to company spokesmen.

TRACTORS IN ACTION

A DIESEL-POWERED track-type tractor performs numerous duties around the yards of the Werk Road Plant No. 2 of Aluminum Industries, Inc., located northwest of Cincinnati. Equipped with a scoop shovel, the tractor loads dross from the stockpile into containers for removal to the reclaimer, a job for which previously as many as 10 men were required.

As shown in the second photo, the heavy-duty unit is also used for



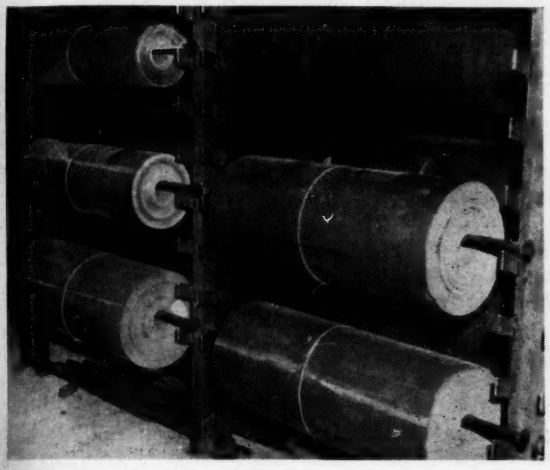
moving and spotting railroad freight cars throughout the plant yards.

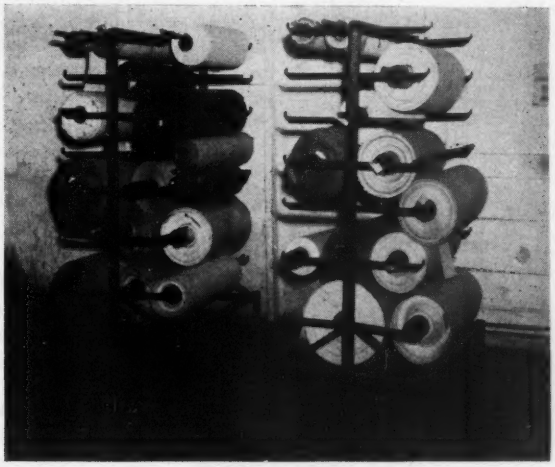
Other jobs it performs are to level waste dumps and, equipped with a snow plow, to clear walks and working areas of snow. *Courtesy, Caterpillar Tractor Co.*

IDEAS ON RACKS

THE Formica Company, Cincinnati, uses two types of racks for storing fabric material required in the manufacture of laminated plastic products. These racks, shown in the accompanying photos, both serve to protect the easily damaged fabric and make possible easy handling in loading and removal operations of the material.

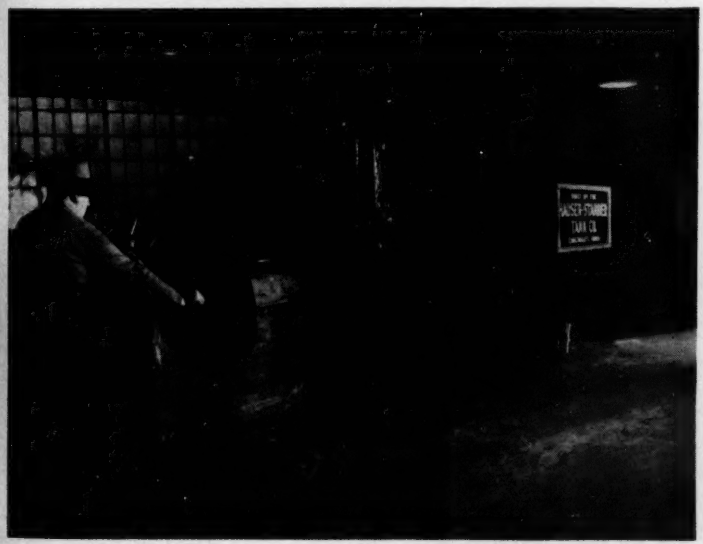
The photo at left shows a section of the stationary racks, on which rolls of brittle fabric are stored by means of the mandrels pictured. Loading and removal of the rolls is accomplished by a powered truck which is equipped with a specially designed lifting attachment. The portable racks, right, are used for storage of various types of decorative fabric material. Since these units can be set up conveniently near to the manufacturing equipment, they are an aid to production and help eliminate extra handling.





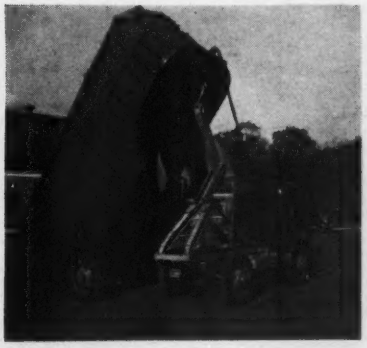
THE TRACTOR IS A PUSHER

Tractors perform many types of pushing jobs in industry, moving heavy machinery and other bulky objects. The one in this photo is shown moving a huge wooden tank, on its way to a flat car. A four-wheel dolly is under each end of the tank, and the transfer from the loading dock to the flat car is accomplished by means of two bridge plates. Thus a "big" job is simplified.—Courtesy, The Hauser-Stander Tank Co., Cincinnati.



GOOD RIDDANCE TO RUBBISH

HERE is how a plant gets rid of its rubbish. The equipment has a patented elevating type fifth wheel mechanism. The specially designed underslung semi-trailer is close to the ground. Its removable canvas top and side door permit loading from the end, side or top. A standard cab is used over the engine truck tractor, and the hoisting fifth wheel mechanism is mounted on the chassis.—*Courtesy, General Electric Schenectady Works.*



IN GOOD FORM

Millions of Parts get there on time at the National Cash Register Co., Dayton, because forms provide adequate overall material control. Five key forms are described here.

THE company's stock control system makes use of 32 forms, and five of these, the subject of this article, are the nucleus around which is built the *material control.* They are:

(1) Invoice card for *manufactured parts.* It is a record of manufactured parts on hand and is used as a guide when more parts should be made.

(2) A record of *purchased material* carried in stock. It contains information as to when purchases are necessary.

(3) An *order* on the manufacturing department to withdraw stock and commence operations. (A tracer sheet, part of this form, keeps a record of material movement.)

(4) Six different colored stock cards which serve as *production orders* after the first operation and designate various months.

(5) Regular *piecework* ticket. Entries are made from this form on the tracer sheet of form No. 3 so as to keep track of material movement.

Three Limits Control Flow

The control system is unusual in that it makes no use of a bill of material as such, although variations from standard parts are of course taken care of from information on specifications that accompany drawings. These are called "featured parts" and are ordered by the analyzing department. They occur when the machine is made to fit the customer's needs. Each production department also schedules its own work. This departmental schedule, however, takes into consideration "due dates" which are established according to "limits" that govern the stock control system.

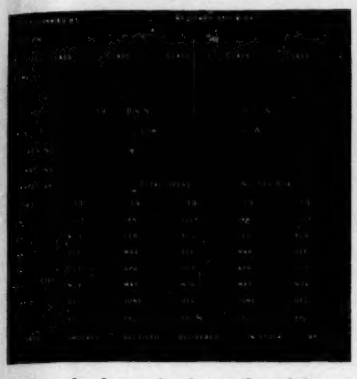
The overall control, however, is based upon the company policy of requiring 90 days for delivery. To keep these delivery dates, parts are carried three months in stock and three months in process. A maximum and a minimum limit is set on the amount of stock to be on hand and to be in process. The limits are based on the figures obtained from accumulative past usage and revised in the light of sales forecasts. The maximum and minimum figures are entered on form No. 1 for manufactured parts and form No. 2 for purchased items. They are revised every six months. On these forms the month-by-month usage and accumulated totals for each six months give a ready reference when setting limits based on historical data. When the minimum figure is reached for stock on hand, the part is ordered into production, or purchased.

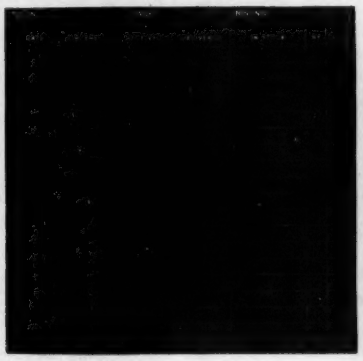
To make doubly certain that the flow of work in process will not be halted because of lack of manufactured parts, another figure is used, known as the "low limit," which represents two weeks' supply in stock of any given part at current usage. This figure is carried on the stock invoice card known as form No. 1 in the column headed R. W. When this low figure is reached the part is immediately ordered into production and given what is called a "Right of Way," that is, it is to have preference over other parts in production.

Control of Manufactured and Purchased Parts

Form No. 1 is the invoice card for manufactured parts. It is a four-page cardboard folder, on the last three pages of which are carried columns similar to those on the lower half of page one. This card is held in a galvanized iron pocket

on the stock bin and keeps a record of manufactured parts in stock. When the stock clerk places an order he enters the quantity and due

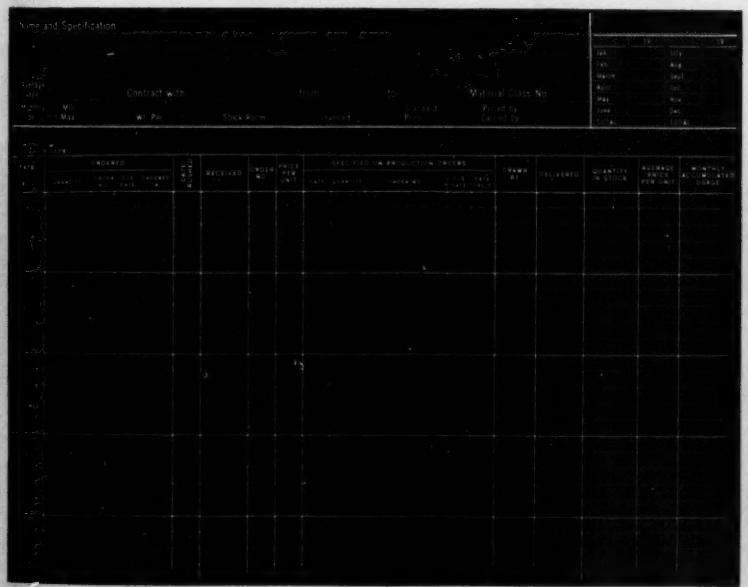




Form 1: 4-page invoice card used for manufactured parts. First cut shows first page; second cut shows one of the three inside pages.

date on the invoice card and returns it to the stock room. The quantity ordered will bring the stock up to or above the minimum limit. The due date will be arrived at by multiplying the figure opposite the column headed "Total Operations" by the three days allowed for each operation. (The three-day period was determined after a study of the history of manufacturing operations as a whole.) When the parts are received in stock the date and quantity received are entered by the stockkeeper and added to the quantity already on hand.

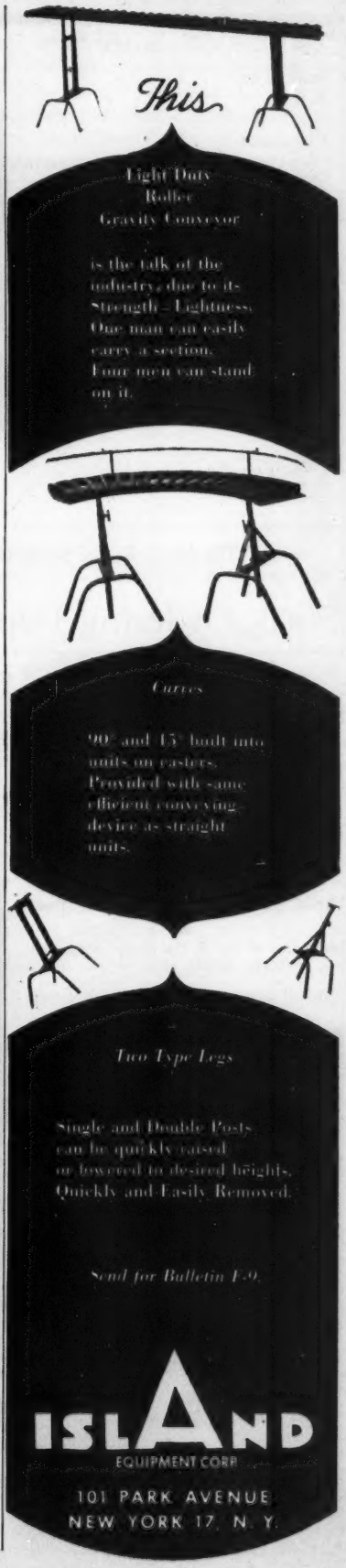
No. 2: This record controls purchased parts; control is similar to that of manufactured parts.



When any of the parts are drawn from stock, the amount delivered is entered in the "Delivered" column and deducted from the amount in stock. The "By number" column is for the check number of the stockkeeper making the transaction.

The bulk of all parts is handled in tote boxes by conveyorized installations at National Cash Register. (See December FLOW, page 11.—Ed.) To insure efficient handling and movement of material, the amount to be carried per box is designated on form No. 1.

Since form No. 1 is the invoice card for manufactured parts only, a record of purchased material carried in stock is kept on form No. 2. This form consists of a columnar sheet pasted on a cardboard back. On the cardboard beneath the sheet are columns for showing usage by insertion of figures for each six months. This record is kept on file in the Stock Ordering Department as a perpetual inventory. Every item carried in stock has a number, which appears at the top of the


This
Light Duty
Roller
Gravity Conveyor
is the talk of the industry due to its Strength—Lightness. One man can easily carry a section. Four men can stand on it.
Curves
90° and 45° built into units on casters. Provided with same efficient conveying device as straight units.
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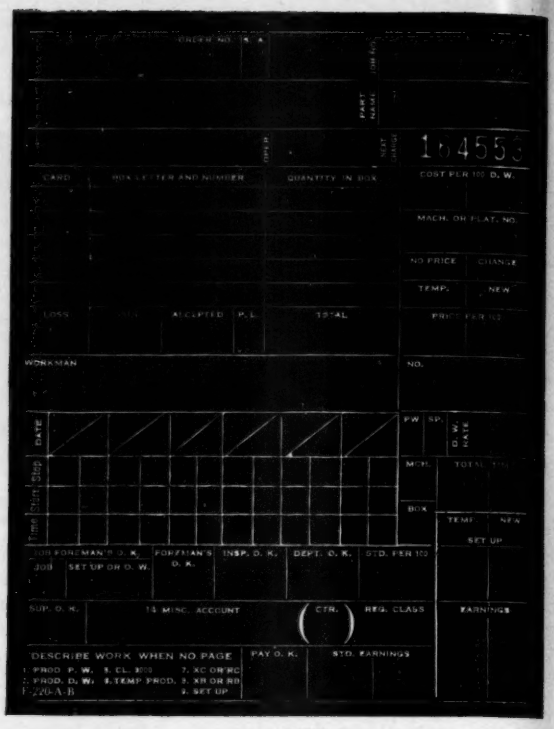
NEW YORK 17, N. Y.

AVER. MONTHLY USAGE	DUE DATE	ORDER NO.
PART NAME		
QUANTITY ORDERED	NO. PER BOX	TRAY NO.	QUAN. PER TRAY
FIRST OPER.	TOTAL OPER.	BIN NUMBER
TO	DEPARTMENT	
MATERIAL REQUIRED		
REQUIRED STOCK IN STOCK		PAGE NO.
DATE REQUISITIONED	LOCATE AT MACHINE NO.	FOREMAN
DATE DEL'D	QUANTITY	WEIGHT

The N. C. R. Co. Stock Order

Stock Ordering Department

Small part of No. 3, above, controls flow of material through shop.

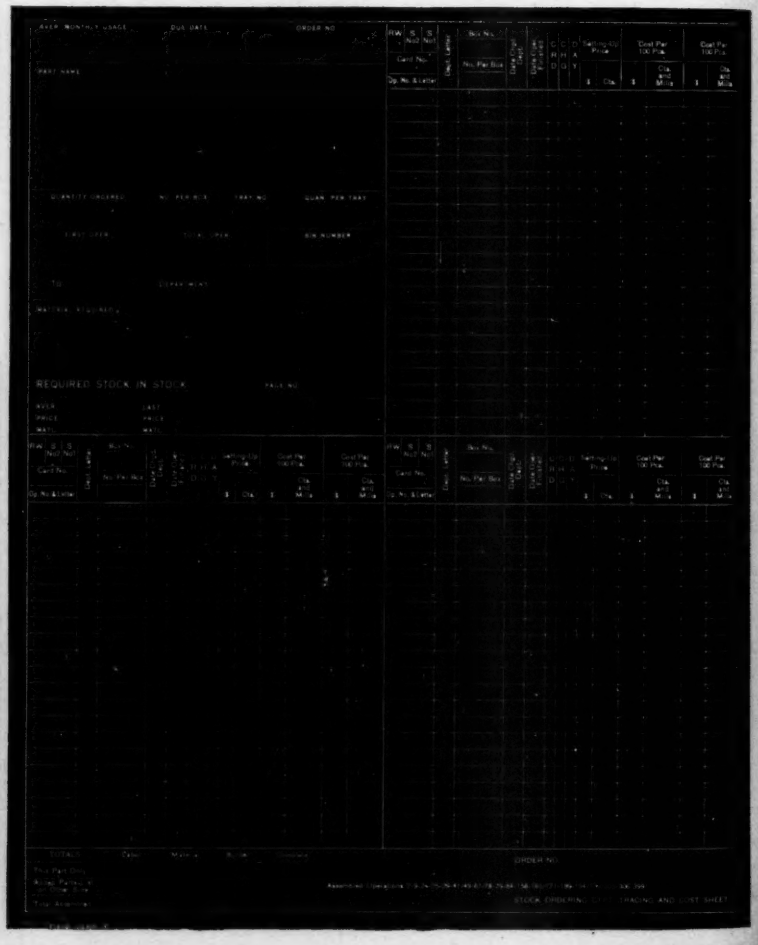


No. 5, above, piecework ticket, with stub-attached at bottom.

record. A similar check on quantities as in form No. 1 governs the contol of purchased items set up on form No. 2.

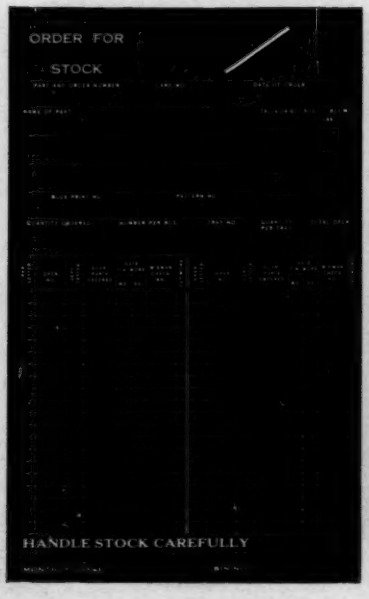
Order to Withdraw Stock

Having insured that manufactured parts and purchased parts



Large part of No. 3, the tracer sheet, right. See complete details given in this article.

No. 4, colored card is production order.



and materials will be available as needed through the use of forms No. 1 and No. 2, the control of the flow of material through the shop begins with the issuance of a work order known as form No. 3. Three copies make up the small part of the form, and this information is duplicated on the fourth sheet, the larger one, known as the "Tracer Sheet."

When limits set on form No. 1 require an order to be issued, form No. 3 is made out. The third copy of this order is sent to the stockkeeper together with Form No. 4 (see second following paragraph). When the making department is ready to begin the work, the presentation of the original or requisition copy of this order is the stockkeeper's instruction to deliver the quantity of stock called for. The second copy is retained in the making department as a record of the order. After the stockkeeper has delivered to material handlers the quantity of stock called for, he enters the date and forwards it to the Stock Order Clerk who enters it in the "Delivery" column of form No. 2, and deducts the amount delivered from the quantity in stock.

The large copy with the perforations is the tracer sheet, on which is kept the record of the location of each box of stock as it moves through the factory. This information is obtained from a copy of the piece-work or day-work labor ticket—see form No. 5.

Form No. 4 consists of six different colored cards, one for each six months, and designates the month the quantity of parts is to be made. They accompany each box of stock in work and are really the production orders after the first operation. (Form No. 3 goes only to the department doing the first operation where the material withdrawn is routed by material handlers.) Subsequent operations, performed upon the same piece, generally require no further withdrawal of material from stock.

Record of Material Movement

The tracer sheet part of form No. 3 is used to keep track of where stock is in the shop and that it is moving as it should. This information is obtained from the regular piece-work ticket, form No. 5, which is sent to the Tracer Sheet Clerks. This form consists of an original and a duplicate with a stub at the bottom of the duplicate. The stub is given to the workman for his own record. The clerks credit the department which has had the stock and charge it against the department to which it is delivered. This record of material movement is made at one time from the same ticket.

The control described is aided by the use of other forms, such as purchase orders, receiving tickets, stock requisitions and the like. As to the system's workability, company officials state that parts are ready on time and in the right quantities, thus contributing to a smooth production flow.

IN YOUR NEXT ISSUE

Handling of bulk and packaged products at a salt company . . . the solution of handling problems in a die casting plant . . . mechanized equipment helps overcome a layout problem . . . how the cooperation between a carrier and shipper is paying handsome dividends. These are just a few of the features you'll read in FLOW for March.

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RATHBORNE, HAIR AND RIDGWAY COMPANY
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"Swinging" Into Position

Articulated fork trucks are in constant use at the Packard Motor Car Company in moving and loading airplane and marine engines. Slots are cut at the sides of the runners for entry of forks. Boxes

are picked up this way so that they can be spotted across the width of the cars. Note that the forks are swung into position without lining up the truck itself, which is made possible by the articulated frame of the machine.

The boxes containing the engines are within an inch or two of the width of the freight cars. And since their length is also greater than the width of the car doors, the large cases must be swung into the cars at an angle if the loading is to be completed in one operation. The second photo shows how this is done by articulating the frame of the truck.

The load shown in the third photo is being lined up inside the freight car, with but fractions of an inch to spare on either side of

the box. According to company engineers, the truck's ability to work in narrow areas and turn in a small radius makes it suitable for spotting these bulky loads in minimum space.

NATIONAL DISTILLERS' TEST WITH UNITIZED LOADS

IN AN effort to overcome the problem of breakage of merchandise shipped in glass, the National Distillers Products Corporation made three carload test shipments with "unitized" loads. At the end of the test run, according to a report made by the company's General Traffic Manager Charles W. Braden, not a single bottle was broken throughout the three cars. National Adhesive, National Starch Products, Inc., cooperated in the tests.

The fibreboard shipping cases were "unitized" through the application of adhesive to the bottom surface of each carton just before it was stowed in the car, thus securing all cases. The use of this method did not involve any major departure from the usual handling of the merchandise, either in the loading or the unloading operation at destination. *(October FLOW, page 27.)*

Route, Stowing, Check

One car, loaded at Carthage, Ohio, and shipped to Philadelphia, consisted of 1,220 cases. The second car, shipped from Louisville, Ky., to New York City, contained 1,100 cases. The third car traveled the same route and was loaded with 1,125 cases. For the purpose of the experiments, the individual loads weighed only 42,000 pounds.

The alcoholic liquors in these three experimental cars were packed in both new and reconditioned fibreboard shipping cases. In one end of each of two cars the cases were stowed by interlocking pattern, while in the opposite end they were stowed end to end lengthwise with the cars. In the third car all containers were stowed end to end. In each case, the proportion of reconditioned containers was considerably larger than that of the new cases.

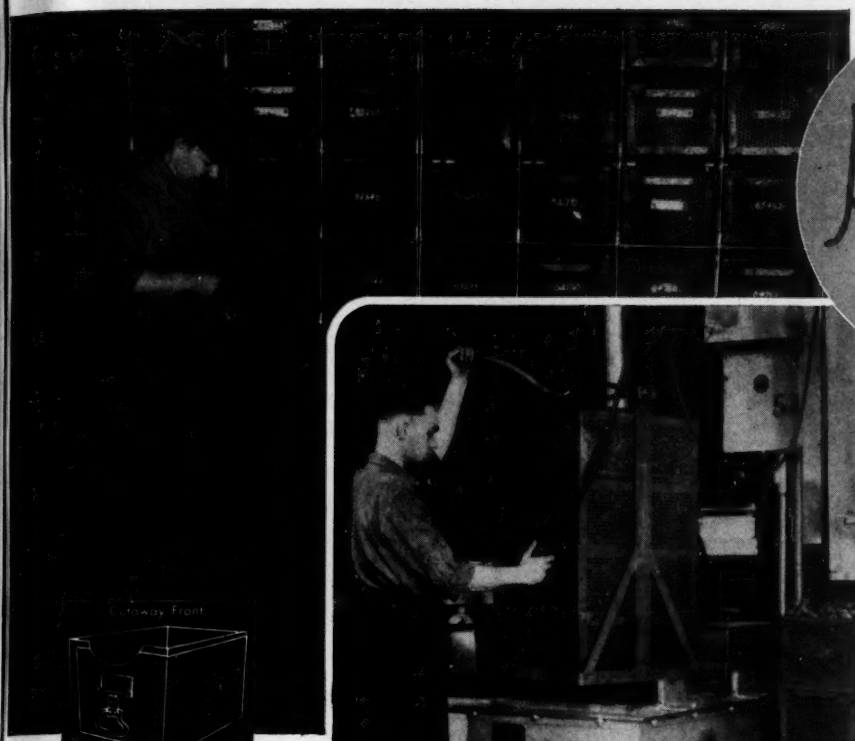
The cars were followed up at destination by the representatives of the two companies and of the two railroads involved. Upon opening of the doors, the lading was found in general good condition. The "B" end of car No. 1 showed a shift of about 10 inches; it was flush in cars No. 2 and No. 3. The "A" end was flush in car No. 1, while car No. 2 had a shift of 3½ inches and car No. 3 a shift of about two inches. "Solid floor load" was observed in each instance.

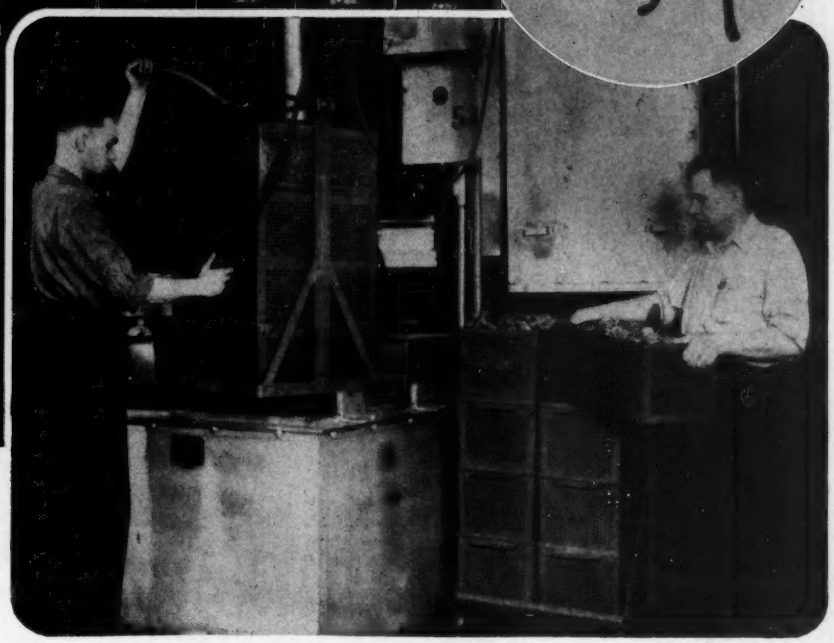
Although there was shifting of the load in the direction of car movement, the shifting was uniform and all cases remained in place, without buckling or side-shifting. Thus the method of stowage and unitizing by the application of adhesive to each case provided sufficient flexibility to dissipate any stress and to keep the cases aligned.

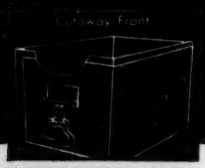
Applying the Adhesive

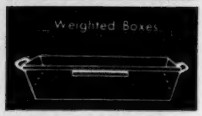
The equipment used was a glue pan and applicator wheels, installed at the end of the conveyor section (in the freight car or at its door). This permitted immediate removal of the cases after application and prevented contact of the adhesive with the conveyor rollers. In the operation, two parallel strips of glue were applied lengthwise to the bottom surface of each case as it moved over the glue pan installa-

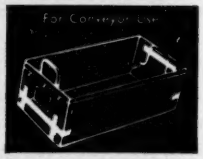
(Turn to page 54)

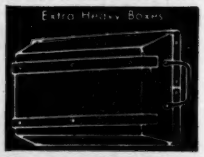


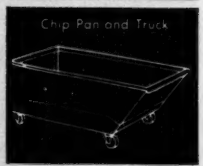












Shop Barrels, Boxes, Chip Pans, Waste Cans, Tool Stands

Yes, WE BUILD 'EM TO FIT

● "Cleveland" steel shop containers are individually engineered for maximum efficiency, as an essential link in your materials handling system. If one of our many stock styles or sizes does not answer exactly, we design and build to order, to fit your products, your shop transportation equipment, production machinery and other factors governing size, shape and special features.

Shop containers so designed and built in many plants have been instrumental in speeding up production and lowering unit cost, often paying for themselves in a few weeks or months; for their cost is small, the results big.

Besides offering many stock sizes and styles of shop barrels, boxes, pans, cans, stools, tool stands and cabinets, bins and shelving, "Cleveland" has become national headquarters for built-to-order steel shop equipment.

New Catalog—illustrates nearly 100 different kinds and sizes. Contains many useful ideas on more efficient materials handling and storage. Ask for it.

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STEEL SHOP EQUIPMENT
STOCK STYLES FOR GENERAL UTILITY
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This•• or THIS

MOVES TONNAGE

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Rehandling is easy when THE CLARK METHOD is used—THINK IT OVER.

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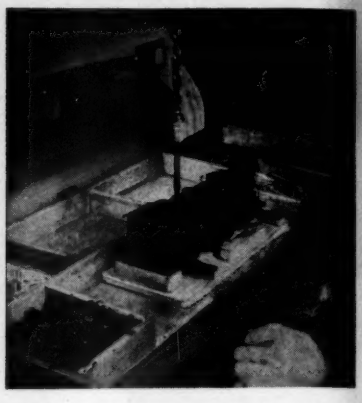
METAL SPOKE WHEELS • GEARS AND FORGINGS • RAILWAY TRUCKS

THE BIG TIME . . .
(Continued from page 31)

pleted with the addition of green side lights.

The boiler parts are then set on the belt conveyor which advances them, as well as some other subassemblies, from work station to work station. The following units are added in the order mentioned: the whistle, number plates (one at each side of the cab), a stamped bracket for the bell. At one of the stations, a simulated bell (having



Note wooden fixture with felt padding.

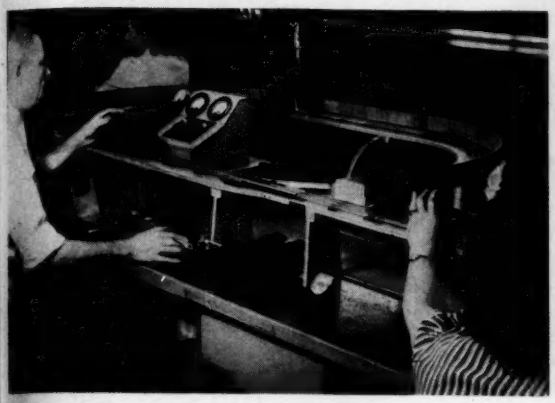
two prongs separated by a slot) is assembled to a cranked wire, and the prongs are pinched together to fasten the wire. This subassembly is then dropped into the bell bracket slots, and the prongs of the bracket are squeezed together around the wire to hold the bell in place.

Another subassembly, the front truck, is made under a power press, which is also set close to the belt conveyor. As at other stations, all necessary parts are placed in trays convenient to the assembler's hands so that the operations are performed in minimum time. As the assembly conveyor advances the parts, hand rails, steps, lamp sockets, piston rods and crossheads and other parts are added by nimble hands. In several operations the work is held in wooden bench fixtures with felt at bearing points to prevent marring of the paint. While these fixtures prevent the work from shifting as screws are being tightened, they are so placed that they also hold the work in convenient position.

The assembly of the electric motor, done on a separate belt, is not

Whistle assembly, with fixtures on indexing ring, shown at right.

Testing station, below: Operator at right checks assembly for completeness and replaces any missing parts.



described here. Assembled motors are delivered to the locomotive line ready for assembly to the underside of the boiler—a simple operation which involves merely the application of two screws. This operation is shown in one of the photos, with the assembly held in a wooden fixture surrounded by trays for screws.

The completed locomotive assembly is advanced on the belt line to the test station (which many grown-up Juniors consider the ideal place to work). Here is a closed track loop with a dead spur onto which the locomotive runs at the end of the test. An inspection and touchup station is located to one side of the operation. If any shortage of parts is discovered, they are applied at a side bench to which the locomotive is temporarily shifted. The units that pass inspection are placed on a belt conveyor, which carries them to the final station. Here girls wrap, pack and insert the locomotives in lithographed cartons, ready for shipment.

The Turntable Subassembly

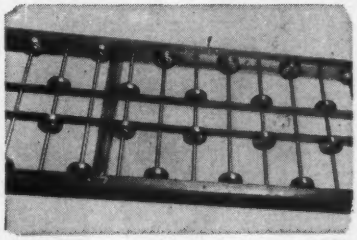
This is the whistle assembly, previously mentioned, which is made on a dial-like machine (or turntable) especially built for handling this particular unit. This built up unit includes a die cast housing, to which the following elements are assembled: a small motor (driving a molded plastic impeller on its shaft), a cover plate with gaskets and fastening elements, and several electric components for the motor.

Parts of the whistle are placed in trays around the circular table and in tote boxes close at hand. The circular table has a fixed center on which some parts may be placed. (The photo shows several completed subassemblies in this center area, though they are not normally placed there.) Between the central and outer fixed tables is an indexing ring containing several fixtures, each having holding elements for specific parts.

Each of the five assemblers places into these fixtures parts taken from the trays before which the operators sit. The fixture ring is stationary except when indexing, and it turns clockwise one space only when the operator at the extreme left shifts a control. When this shift is made, the ring is turned slowly by power until one group of parts in the fixture comes below the ram of the power press with which the ring is synchronized and interlocked. When the fixture ring comes to rest at the indexed point, the press is tripped automatically and the ram, carrying numerous punches, drives rivets and presses other components into place. This finishes the assembly and fastens its components into one unit.

Assemblers are away from the press ram and cannot well reach under it—hence the setup is safe. It is also highly efficient. Each operator has specific operations to perform and soon becomes so skilled that she can perform them rapidly and almost automatically. The operator at the extreme right (see photo) removes the completed assembly and places a new housing in the space it occupied, thus starting a new assembly after each indexing. Removed assemblies are ready for test and final inspection.

The CHEAPEST Distance Between Two Points



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STANDARD MODELS 12", 15" or 18" wide—5′ or 10′ lengths—6, 8 or 10 wheels per ft.—45° or 90° reversible curves—3 sizes adjustable stands—from 12" to 78".

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SPEEDWAYS CONVEYORS, INC.

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LETTERS TO FLOW . . .

(Continued from page 4)

which apparently escaped the editor. This (photo) is in the lower right-hand corner and shows a girl reading the weight of a carton which is on the scale. Please note that she is weighing at least one and possibly two hands.

Who pays for the extra weight? —L. A. Cherry, Cherry, Cushing and Preble, Consulting Engineers, Buffalo, N. Y.

The responsibility is entirely with FLOW'S photographer, who asked the operator to place her hands on the case for the sake of obtaining a better composition. To ease Reader Cherry's mind, the weight of the case had been recorded before the shot was made. OK?—Ed.

To FLOW:

"Interesting and Useful"

I have had the opportunity of reading the first and second issues of your new magazine FLOW, and find the contents very interesting and useful.

Enclosed please find check and order for a subscription, also coupons for free literature described in the fist two issues.—R. A. Bingham, Methods and Standards Department, Easy Washing Machine Corp., Syracuse, N. Y.

To FLOW:

Converting the Old

I have read with a great deal of interest the three issues of FLOW which have appeared so far, and I want to congratulate on the editorial job you are doing.

I thought, however, that you may be interested in one reaction I had which may possibly be of value to you. It's this. I notice that practically all of the articles deal with nice modern installations in nice modern plants, and usually the latter are of the one-floor type.

But what about the fellow—I mean the company—that has to get along with a pretty old building? I have in mind, say, a seven-story building of about 50 x 200 feet. If you would feature some articles showing how modern handling equipment and methods were introduced into buildings of this kind, I think it would be of interest to a great part of your readership. —S. K. R., New York City.

Reader S. K. R. has hit on a problem in which FLOW is vitally interested. The plants investigated so far, however, have not all been "modern plants," and only a few have been of the one floor type. Articles now being worked up will, we hope, cover S. K. R.'s problem. —Ed.

To FLOW:

Coming Up

We hope that from time to time you will run articles on plant layouts. This is a subject in which we are very much interested.—Henry F. Schroeder, Vice President, Milwaukee Die Casting Co., Milwaukee, Wis.

An article on the subject, now being developed, is scheduled to appear in an early issue.—Ed.

NATIONAL DISTILLERS' TEST WITH UNITIZED LOADS . . .

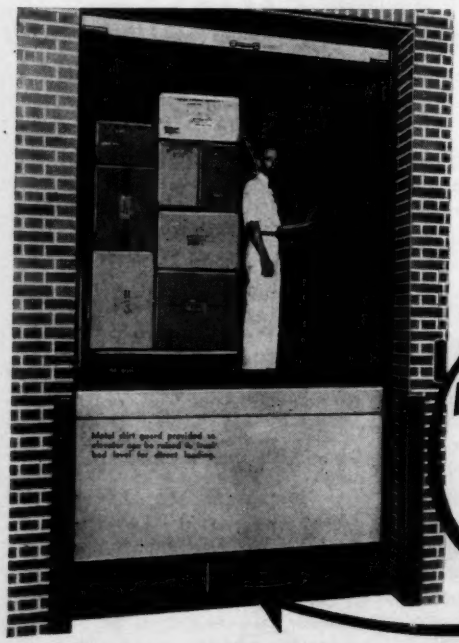
(Continued from page 50)

tion. Each strip of glue was about two inches from the outer edge of the containers. After removal, the case was stowed on top of its neighbor case in the car.

The glue compartment pan was made sufficiently deep to accommodate applicator wheels approximately four inches in diameter. The wheels, about ⅝ of an inch in width, were mounted in pairs on a shaft hung in such a position to permit contact with the bottom surface of each case passing over the pan. (The applicator wheels were about ¼ inch higher than the surrounding rollers of the main conveyor.)

The gluing of the cases did not result in any damage to the cases generally, though there was some tearing of the fibreboard. This, it was determined, could be corrected by the installation of scrapers on the adhesive applicator wheels. A sharp upward blow of the hand was sufficient to separate the boxes at destination.

As a result of this test, the report proposed that National Distillers adopt the unitized method as standard for the future.



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NO HEAVY WALLS
NO MACHINE ROOM

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OILDRAULIC Elevators are designed for dependable operation at lowest cost. No penthouse or heavy load-bearing shaftway structure required . . . powerful hydraulic jack pushes load up from below. Extremely smooth and accurate landing stops. Power used during rise only—economical. Compact electric power unit. Car sizes and capacities as required. All popular controls. Practical for rise up to 40 feet. For freight or passenger service. Write for Catalog RE-301.

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• Here's a *factory-built* conveyor system that will fit your *custom-built* plant completely!

No special engineering. No delay for estimates on cost. No weeks of waiting for factory fabrication. Barber-Greene Conveyors are pre-engineered—pre-fabricated!

B-G Conveyors are built in a variety of sizes, forms and capacities, to meet any material handling requirement . . . can be installed anywhere.

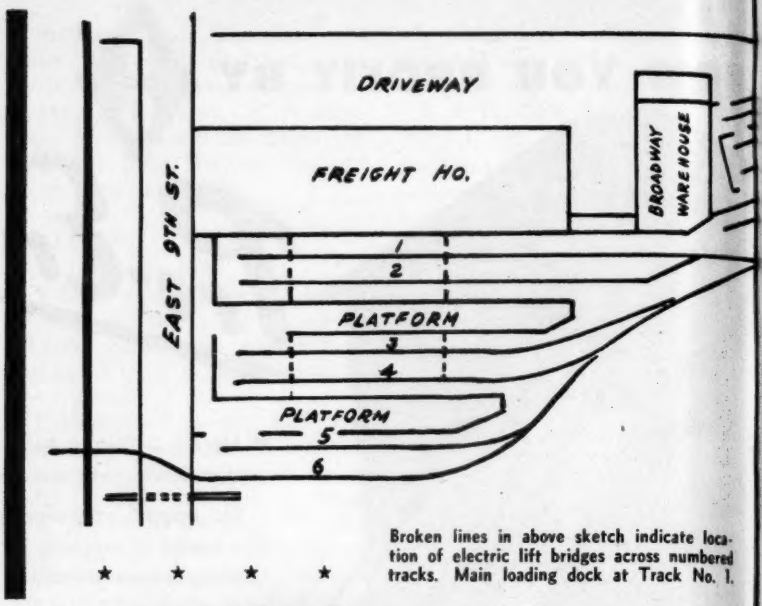
Erection costs? Your own workmen can install a B-G Conveyor system quickly, easily. Units arrive on the job conveniently marked. Factory assembled terminals and standardized units simplify and speed erection.

Barber-Greene Conveyors are *standardized.* You can make additions and alterations rapidly . . . move it to a new location with 100% salvage. Factory assembly assures correct alignment in erection—reduces belt wear and maintenance expense. Write for Catalog 76. Barber-Greene Company, Aurora, Illinois.

45-20

Barber-Greene B G *Constant Flow Equipment*

Flexibility Or Bottleneck?



Broken lines in above sketch indicate location of electric lift bridges across numbered tracks. Main loading dock at Track No. 1.

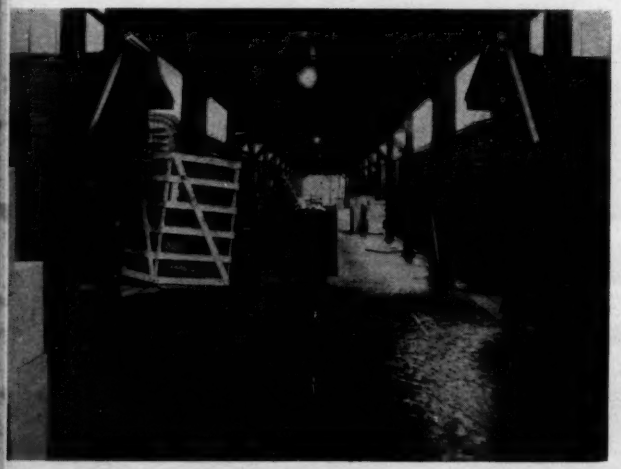
Keeping production up and handling costs down—a variety of handling equipment at this freight station does the job. In addition to the usual loads, bulky and odd shaped objects are handled with dispatch.

THE lifting and carrying tasks at the Nickel Plate Railroad's principal freight station, Cleveland, are many. Items of production for civilian use are increasing the variety of sizes and weights of shipments handled today. Generally these items weigh less than military goods of corresponding bulk used to weigh.

As a result, the task of handling an average of 700 tons of L. C. L. freight per day at this station requires more trips by material or freight handlers than prewar because of the increased volume of lighter, bulkier and fragile freight designed for domestic consumption. Only by the proper selection of mechanical handling devices to do a particular job can the cost of this type of handling be held in line and production maintained. Hand and power trucks of all types and descriptions, each designed to do a particular job, help furnish the flexibility and mobility desired.

Crane trucks do many jobs. Here one is transferring LCL shipment of heavy pipe.

The freight station is a two-story building approximately 660 feet long and 65 feet wide. The entire lower level is devoted to the handling of L. C. L. freight. The receiving and delivery dock on the east or highway side of the build-



Fork truck is about to carry heavy piece of machinery across lift bridge into freight house.

An 8,000-lb. load of steel, with a roller at far end, is moved from truck level to station.

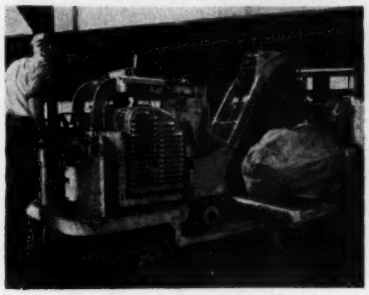
ing has 34 doors, each of which can accommodate two highway vehicles or a total of 68 units. The west or track side of the building is practically flush with No. 1 house track. Island platforms 18 feet wide between tracks 2 and 3 and between tracks 4 and 5 add to the dock facilities. Track No. 6 is reached by bridge plates from cars on track 5.

Each of the six tracks accommodates approximately 15 cars. An average of 60 loaded merchandise cars and a fluctuating number of empty cars are spotted in the freight house each night. Between the house proper and the island platforms are electrically operated lift bridges, which are interlocked with a safety device. Generally a path or runway is cut at every fifth car to shorten the travel distance of freight handlers.

Approximately one half of the freight house is assigned to temporary storage areas which are keyed to an alphabetical index for the purpose of readily locating shipments by consignee's name. This facilitates handling direct to customer or to the railroad's delivery company. Large, heavy and bulky shipments are handled in a separate area reserved for that purpose, which eliminates congestion and possible disruption to the alphabetical location system.

Whenever possible, multi-unit loads are carried. These are frequently transported on skids, semi-live skids, live skids and pallets by fork trucks. Two-wheel type hand trucks are adapted to carrying numerous pieces of freight at one time by inserting toe boards. These move a considerable tonnage on short hauls. Hand lift trucks of various types are used to move palletized and skidded freight short distances. A study is being made to determine what can be accomplished in the way of facilitating handling and effecting economies by expanding the use of palletized or skidded materials through closer cooperation with the shipping and receiving public.

In addition to handling a volume of freight in palletized loads, industrial fork trucks are used frequently throughout the day to handle individual pieces of heavy or bulky freight. The fork truck is particularly adaptable to these operations since it is self-loading and unloading and is capable of picking up and spotting freight quickly.



Skid-mounted 3,000-lb. motor is picked up with ease and moved into freight car.

At the Cleveland freight station of the Nickel Plate, each fork truck will handle an average of 40 tons of freight daily. This is significant in view of the many other duties these trucks perform. Fork trucks are also space savers in the freight house as well as in cars because of their ability to tier or stack materials. Frequently they serve the purpose of a small crane when by use of chain slings they lift and move heavy wheels, gears and similar individual pieces of freight.

Mobile crane trucks, also in use, have a practically unlimited operational range and perform many lifting and carrying operations that would otherwise be extremely difficult and costly. Long and heavy sections of steel plates and tubing and other odd shaped pieces, for example, can readily be removed from gondola cars with this equipment. With equal facility mobile crane trucks remove heavy materials from highway vehicles and place them directly into outbound freight cars. Because of their load carrying capacity, they can also carry a heavy multi-unit load in one trip where other means of handling would require several trips. Their ability to lift heavy loads is often made use of to spot large or cumbersome pieces onto live skids or dollies, for removal by other units of the truck fleet.

The Nickel Plate has found that the variety of mechanical handling devices available gives their crews a ready answer to the many specific problems constantly presenting themselves.

Not merely built, but

Engineered for Utmost Safety

● The very dangers which most often threaten life, limb and load simply don't happen when you use ACLC Safety Hoist Hooks.

Makeshift mousing gives place to automatic mousing. Snagging can't occur because no protruding point "asks" for it. Hook straightening and load slippage are avoided because the patented shoulders and lip LOCK the load in perfect alignment.

Time saved—men spared—cleaner jobs; hence more profit. Send for details Now!

American CHAIN LADDER CO., INC.
151 East 50th St., New York 22, N. Y.

ACLC Safety Hoist Hooks are manufactured in three models—Eye Type, Shackle Type, Shank or Clevis Type.

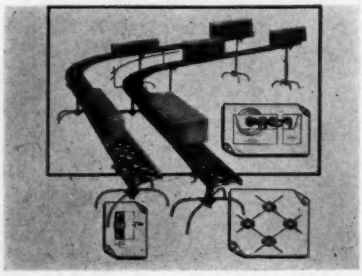
ACLC Safety HOIST HOOK

For additional information on these products, write Dept. 5, Flow Magazine, 812 Huron Rd., Cleveland 15.

PORTABLE CONVEYOR

THE Load-Veyor, announced by the Market Forge Company, is a light-weight unit that is reversible so that either side may be used. While large packages move on one side, small ones may be conveyed on the other side, according to the company. When the equipment is thus used the side members act as guide rails.

Each 10-foot section weighs 58 pounds. Removable connectors or couplings are available, which simplify the assembly of the unit. The stands may be attached in any position along the length of the

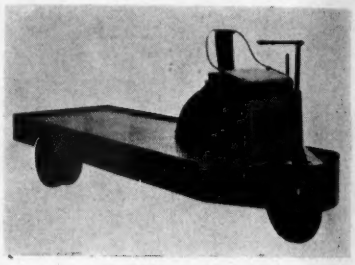


conveyor, so that sufficient support may be furnished to accommodate any practical load. Load-Veyors are also available in aluminum or stainless steel. A complete line of accessories, to be provided, will include curved guard rails, adjustable and reversible stands, package retarders and stops, and others.

PLATFORM SHOP TRUCK

THE Buda Company's Chore Boy, model FF, is a dual wheel, heavy duty, platform type shop truck of one-ton capacity. It has a large non-skid deck with a loading space of over 20 square feet.

Its construction features include an electrically welded reinforced steel frame. Spring-cushioned seats with form-fit back rests make it easy for the operator to drive, it is pointed out. The controls are simplified with a hand lever for forward, reverse and neutral gears. The seat cushion is provided with



a safety hinge so that when the operator leaves his seat, brakes are automatically applied, according to the announcement.

HAND TRUCK AND SKID

KNUCKLE guards on the handle of a hand truck, developed by Palmer-Shile Co., Detroit, provide a safety feature for the operators, according to an announcement by the company.

The truck is provided with a

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It's speedy, lightweight and versatile . . . . the Tote-All Conveyor, the modern fast way to handle bulk material up to 14" top size, such as sand, gravel, coal, brick, salt, etc., etc.

Demountable gasoline or electric power unit optional . . . 14 ft. and 20 ft. lengths . . . flanged sides or sliding hopper to meet your requirements . . . Trail hoist, combination trailer and hydraulic lifting device adds to versatility of the Tote-All.

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Tote-All Conveyor—*steps up production and man power efficiency and lowers production costs!*

Write Today for Bulletin W

. . . . Describes Tote-All Conveyor in detail. (Also ask for descriptive literature on the new Tote-All Package Conveyor.)

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PORTABLE CONVEYOR

TOTE-ALL DIVISION
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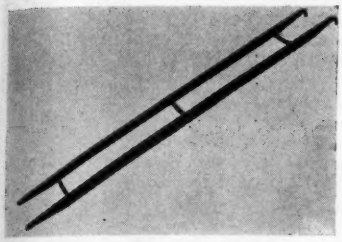
Phone Harrison 6035-6-7

heavy nose plate extending seven inches to insure easy pick-up. It is said to be adapted to heavy lifting where limited space prohibits the use of larger equipment. The construction consists of angle iron cross bars welded on an angle iron framework. It is furnished with 8" x 2" roller-bearing wheels.

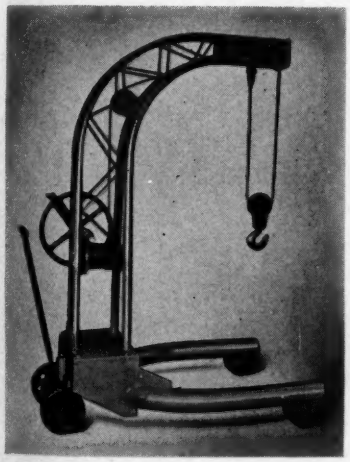


Palmer-Shile is also manufacturing a new light-weight, all-welded skid, shown in the accompanying photo. The eight-foot length unit, illustrated here, is 14 inches wide and weighs 45 pounds. The skid is available in several sizes.

PORTABLE CRANES

PORTABLE cranes for handling loads where overhead lifting equipment is not available are now being manufactured by the Hill Acme Co., Cleveland.

These welded steel cranes, the company says, weigh less than half as much as their previous models



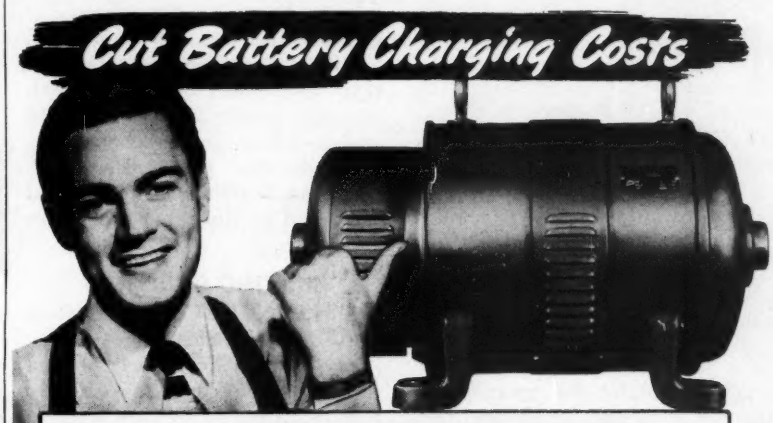
and are provided with two-speed operation by means of a single and double cable for light or heavy loads. An adjustable extension handle gives additional leverage for extra heavy loads. Also featured is a self-locking worm mechanism which is said to safely hold the load at any point.

TRANSFER CARS

THE accompanying photo illustrates just two models of transfer cars made by the Easton Car and Construction Co., Easton, Penna. This flanged equipment, used in many industries, is usually built to run on straight tracks only, according to the manufacturer. These cars have rails on top and are used to carry other wheeled equipment. On small cars, the

minimum height from top to top of the rail is about 6", and on heavy cars it increases up to 18" or 20". Transfer cars may be built with two or three tracks.

Special heavy-duty transformer



This patented DIVERTER POLE
BATTERY CHARGER
does it ...

Developed particularly for battery charging, this machine has PATENTED Hobart Diverter Pole Winding. Is unusually compact and light in weight. It is a two-bearing set, the squirrel cage AC rotor and DC Generator armature being mounted on a solid shaft, supported at each end by oversized bearings • Four models, Single Circuit, Two Circuit, Three Circuit and Four Circuit, for charging one, two, three or four batteries simultaneously. Fully automatic, shutting down in case of power failure or when battery is charged. Custom-built, totally enclosed and splashproof. Write your requirements. Will submit specifications and prices on suitable charging equipment.

MOTOR GENERATOR CORP., BOX FL-26 TROY, OHIO
Division of Hobart Bros. Co.

MOTOR GENERATOR CORP., BOX FL-26 TROY, OHIO

Please send me without obligation complete information on your vehicle battery charger. We require equipment for charging_____batteries of_____ampere hour capacity, with_____plates per cell, _____cells per battery. Motor should operate on_____current.

Name _____

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MGC
BEST IN ELECTRIC GENERATING EQUIPMENT SINCE 1893

transfer cars are made in capacities of 50, 75 and even 100 tons, states the company. These units are used by electric power stations to facilitate the removal of transformers to maintenance shops.

ALL-WELDED TRUCK

THE Schmidgall Manufacturing Co., Peoria, is now manufacturing a steel all-welded truck espe-

cially adaptable for operation in narrow aisles and for picking loads in close quarters.

A large carrying platform and slightly curved bands make the truck suitable for handling barrels, kegs, sacked materials, as well as boxes or crates. It can be carried on a motor truck.

According to the company, a balanced design places the load on the wheels, not on the trucker, while a single handle makes possible the handling of bulky and heavy loads with one hand.

ELECTRONIC SWITCH

AN ELECTRONIC switch that can be used in the presence of explosive gases has been developed by the United Cinephone Corporation. This model uses a relay with contacts which are hermetically sealed. These switches are used primarily for pressureless limit switching, floatless control of liquid levels and to eliminate contact arcs and welds.

HOISTING EQUIPMENT

AN ANNOUNCEMENT from The Lewis-Shepard Products, Inc., states that features have been added to the company's Handy Hoister. Among these are a heavy gauge steel construction of the bracket, backplate and platform; roller bearing sheave on a hardened and ground shaft; channel type uprights; ball bearing guide wheels; open end base and swivel casters, and others. The unit is

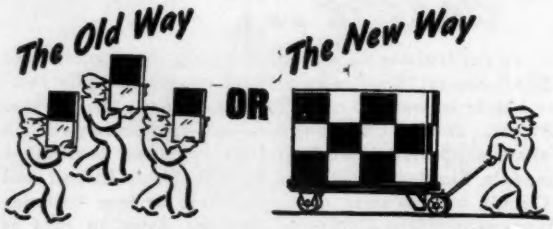
designed to fit into any manufacturing process requiring the lifting and transporting of tools and raw materials.

MUTUAL ATTRACTION

Tons upon tons of material are handled daily by means of this mobile crane equipped with a mag-

net. Standard 24", 29" and 39" magnets lift from 275 to 900 pounds in a single load, depending on the type of material to be moved. Current for this magnet can come either from nearby electric lines, or from a generating unit mounted to the back of the operator's seat.—*Courtesy, The Hughes-Keenan Co.*

DOES YOUR PLANT OPERATE ITS MATERIALS HANDLING DEPARTMENT

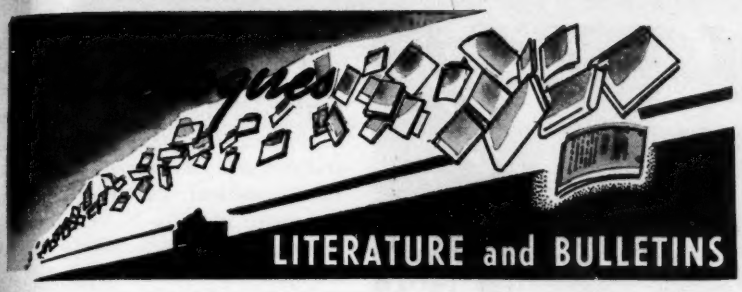


Our representative will be glad to discuss with you the possibilities of safer—faster production with special superstructures designed for handling heavy materials on production lines.

Investigate the unit cost-saving advantages of adequate skid platform, semi-live skid and floor truck facilities. Illustrated literature is available. Ask for bulletin 40, please.

IRONBOUND BOX & LUMBER CO., 30 Hoffman Place, HILLSIDE, N. J.

Ironbound MATERIALS HANDLING DIVISION



The publications featured on these pages were written by experts. They are FREE publications. To obtain these write to FLOW MAGAZINE, 812 HURON ROAD, Cleveland, 15, Ohio.

114—Centrifugal Control . . . a four-page catalog describing a new model of governor that is centrifugally controlled. Installation and adjusting instructions are included. Offered by the Monarch Governor Company.

115—Handling of Boxes, Barrels, Bags, Bales, etc. . . . four bulletins issued by the Elwell-Parker Electric Co., deal with numerous types of loads and economical methods of handling them. These bulletins supplement the booklet "Industrial Logistics: A Survey of Management," recently issued by the company. They are designed to assist manufacturers and distributors to determine methods of handling various types of loads.

116—Spot Conveying . . . an eight-page illustrated bulletin concerning a new Power-Flex unit system of material handling. It explains the use of differential coupling rolls in taking care of spaces between units when set at abrupt angles. The automatic discharge control, quick removal push button switch control and power-pac unit are all fully explained. A publication of the Island Equipment Corporation.

117—Conveyor Belts . . . a fully illustrated 132-page booklet issued by the Cambridge Wire Cloth Co. Belt applications, constructions, choice of materials, specifications, high temperature belts, conveyor design, installation and operation are covered. The publication includes useful tables, also data sheets in questionnaire form that may be sent to the company.

118—Electronic Motor Controls . . . a folder presenting the developments of Varitronic Motor Controls and their unlimited application to all types of material handling equipment. The Electron Equipment Corporation describes and illustrates its products and gives operating features.

119—Portable Cranes . . . Numerous applications of this equipment are illustrated in actual operations. Examples are lifting, assembling, plant maintenance, transporting, unloading and other specific jobs. Dimensions as well as engineering and construction data are included. A 4-page presentation by the Hill Acme Co.

120—Transfer Cars . . . an eight-page bulletin (No. 36) showing numerous types of industrial transfer cars. These cover typical models used in a variety of industries. Also included in the presentation are transformer cars, made in capacities up to 50, 75 and 100 tons. An illustrated publication offered by the Easton Car and Construction Co.

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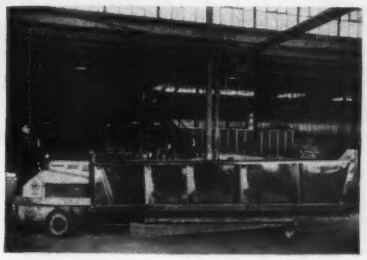
SPECIAL DOLLY

LONG and heavy objects such as the dump-truck body shown in this photo may be transported readily by means of a two-wheeled



dolly and a low-lift platform truck, according to an announcement by the Elwell-Parker Electric Co. The body is approximately 15 feet long, three feet high, and six feet wide.

The sides are shaped and turned down. The forward end is mounted on wheels and the rear end rests on the floor. The upper surface is of a height making it easy for the truck's platform to be pushed underneath it, states the company. By lifting the rear end of the dolly off the floor the entire load is supported on wheels, four on the industrial truck and two on the dolly.

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engineered and produced to customers' individual requirements, are effecting appreciable savings over trucks commonly used. . . . Perhaps special trucks, designed by us for you, can cut your materials handling costs.

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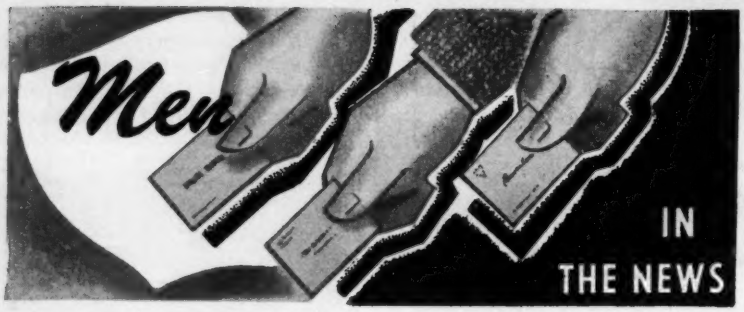


GEORGE L. MEYER, JR., chairman of the board of directors of The Bassick Company, Bridgeport, Conn., has been elected president, succeeding W. A. Rose, who has resigned effective January 1. At 65, Mr. Rose tendered his resignation as president and general manager, but will continue as a director. Mr. Meyer will retain the chairmanship, according to J. S. Knowlson, president of Stewart-Warner Corporation, Chicago, of which The Bassick Company is a subsidiary. The Bassick Company is the world's largest producer of casters and also makes a number of other products.

Walter F. Herold, who has been a vice president and chief engineer of The Bassick Company, was elected executive vice president and will continue in direct charge of engineering. He will serve as senior officer during absences of Mr. Meyer, who in addition to his Bridgeport responsibilities is head of Stewart-Warner's Stewart Die Casting Division in Chicago, and a vice president of Stewart-Warner Corporation.

NEIL C. REED, who managed the Aircraft Application Department of the Westinghouse Small Motor Division during the war, has been appointed manager of District Operations, according to a recent announcement by Walker G. White, manager of the Elevator Division of the Westinghouse Electric Company, Jersey City, N. J.

Mr. Reed will be responsible for elevator installation and sales activities of Westinghouse district offices throughout the United States.

THE election of *John W. Leslie*, President of Signode Steel Strapping Company to the Board of Directors of American Foundry Equipment Company, Mishawaka, Indiana, was announced by Otto A. Pfaff, president. Mr. Leslie is also a director of Pyke-National Company and Hammond Instrument Company.

FILLING a new position created for the supervision of the firm's newly-founded advertising and public relations program, *Robert M. Whitney* has been named assistant advertising manager of the Automatic Transportation Company, Chicago, division of the Yale and Towne Manufacturing Company. Whitney has been with Automatic for nine years, having previously served in the position of assistant sales manager.

R. M. Whitney

R. H. Snyder

R. H. SNYDER, formerly of Cranford, New Jersey, has been appointed Sales Manager of The Hertner Electric Company, Cleveland, Ohio.

With experience in electrical machinery, Mr. Snyder will follow this field as applying to battery charging equipment and other applications.

FRANK E. KEARNEY, newly appointed general sales manager of the Lehigh and Lackawanna Warehouses, Jersey City, N. J., has been installed as president of the Traffic Club of Jersey City, Inc.

Other officers appointed are: 1st Vice President E. A. Meyers, traffic manager, American Home Products Corporation; and 2nd Vice President Carl S. Langen, traffic manager, Republic Carloading and Distributing Co.

OPPORTUNITIES

Men wanted. Jobs wanted. Lines available

RATES: minimum, 25 words, $2.00; each additional word, 10c. Bold type or all capitals: minimum, 25 words, $3.00, additional words, 15c. All insertions are payable in advance.

LINES WANTED

Attention: Material Handling Equipment Manufacturers—Do you need representation in Cleveland, Ohio, and surrounding areas? We are interested in obtaining additional equipment. If you manufacture skids, pallets, castors, conveyor equipment, overhead handling equipment, hand trucks, barrel trucks, and similar materials handling equipment, please contact us. Box 15, FLOW.

A mechanical engineer specializing in material handling equipment, with twenty years' experience in sales engineering, designing, construction, and installation of such equipment, would like to communicate with manufacturers who want representation on the Pacific coast in overhead handling equipment, cranes, hoists, monorails, elevators, lift trucks, conveyors, and special handling devices and accessories. Box 14, FLOW.

LINES AVAILABLE

Manufacturer of material handling equipment needs two representatives, one in the midwest and one in southern states. Expansion now under way and will be backed by complete merchandising program. Applicants should have several years of material handling experience. Write complete data. Box 18, FLOW.

HELP WANTED

Mechanical or industrial engineer, technical graduate, with material handling experience needed by eastern manufacturer for survey and consulting work. Attractive proposition to qualified person. Write experience and education in first letter. Box 19, FLOW.

ON THE PALLET . . .

(Continued from page 28)

side boundary of the market area within which the particular product can be distributed from a particular origin.

A partially explored field is in integration between production or warehousing processes and transportation requirements as to packaging and loading. During the war, the practical possibilities of palletizing unit loads were fully exploited by the armed forces, especially the Navy. Numerous rehandling operations were thus eliminated, saving breakage and reducing cost and time factors. Will use of returnable pallets develop under peace-time conditions? The answer is not yet clear. This answer depends upon careful study of all factors involved, by well-trained, experienced traffic executives such as are assembled here this evening. It depends also upon even greater cooperation by traffic managers with their fellow executives, to develop composite shipping, storage and production plans.—*From an address by E. G. Plowman, Traffic Vice President, United States Steel Corp.*

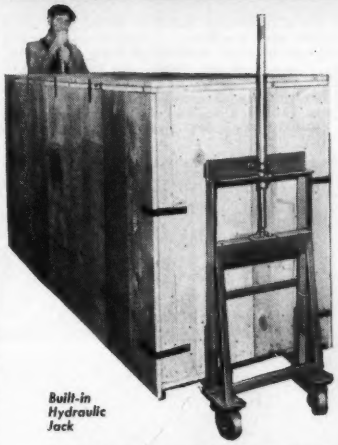
THE great majority of textile mills today are lacking in mechanical improvements. Handling operations represent a substantial cost in textile production, and much of it can be done mechanically.

When operators are relieved of such labor-consuming work they can spread their attention over more machines. This will enable women workers to perform many jobs now done by men. Practically every operation involving conveying and handling is susceptible to mechanization to a greater or less degree. Bale cotton, open cotton, cloth, starch, chemicals, heavy boxes and packages, lap cans, roving yarn trucks, bobbins, shuttles, warp beams, coal, fuel and ashes are items requiring labor for handling and which can be profitably mechanized. Where manual labor is essential, this can be reduced to a minimum by adopting machinery layouts that will provide the shortest moves of the products involved.

While electronic devices have been introduced in cloth rooms, bleacheries and finishing plants during the past few years, their possibilities seem to have been overlooked in the other branches of the industry. These devices could be coupled with mechanical handling systems so that automatic loading and unloading of the devices could be accomplished. They could also be used as selector devices to synchronize one conveyor system with another, or to direct the flow of stock being carried to predetermined locations in the plant.

Plant structures should be designed for mechanization. Buildings should be as free as possible from posts and columns if the maximum benefits of mechanization are to be obtained. Wide clearances allow fullest use of the available floor space. Many possibilities for increasing production from machinery exist in almost every plant.—*John A. McPherson, John A. McPherson Co., Industrial Engineers, Greenville, S. C.*

Something NEW IN MATERIALS HANDLING!



Built-in Hydraulic Jack

THE MONTOUR

ROL-A-LIFT

Puts Wheels on any Crate or Box up to 6000 lbs.

A necessity in shipping rooms, railroad freight houses, factories, store rooms, warehouses, truck, railroad and marine shipping terminals, or in freight pick-up trucks.

TWO MEN DO THE WORK OF SIX . . .

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Make DRUM and BARREL HANDLING AN EASY ONE-MAN JOB and Cut Costs

Gone is the need for helpers in handling barrel and drum loads up to 800 lbs. Sabin Trucks not only eliminate this added cost but make work easier and safer for trucker. *Exclusive Third-Wheel Feature* insures better load support and balance. Load travels easily on roller bearings.

SABIN One-Man TRUCK

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6538 Carnegie Ave.
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ALSO TOTE PAN, BOX, CARBOY, KEG TRUCKS!

Barrel Truck

Loads Automatically

Barrels weighing up to 1,000 lbs. can be handled with ease . . . Truck weighs only 85 lbs.

To load, you simply shove truck up against barrel or drum, then drop the sliding steel "catch" down over the rim . . . pull truck handles toward you and it will load automatically without rocking or tugging.

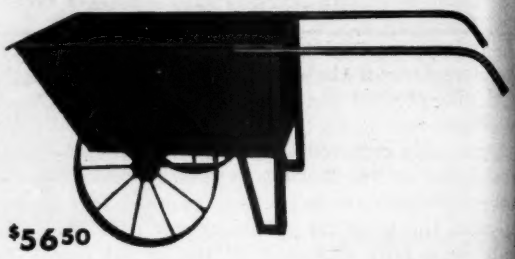
Loads from a row as easily as when barrel stands alone.

Two 10", roller bearing wheels. Greatest width at any point is only 22", thus permitting it to pass through aisles and doors too narrow for many trucks. All welded. Finished in air dry enamel.

Item S-911.....**$33.50**
Equipped with metal wheels

Item S-911-R.....**$38.50**
Equipped with molded-on rubber wheels

Sliding catch grips barrel rim and holds securely until released by operator; note long hook for bilge type barrel.



$56.50

Multi-Purpose Cart

Item B-391

The ideal cart for moving and dumping ashes, scrap, small parts, mixed concrete, liquids, fertilizer or other materials. Sturdily constructed to handle heaviest loads and stand up under roughest usage. Design and balance result in easy wheeling and convenient dumping.

Heavy steel body with reinforcing flange all around the top edge. Inside measurements of body: 45" long at top, 32" long at bottom, 24" wide and 17" deep. Overall measurements: 79" long, 30" high, 30" wide. Two 24" by 2" steel spoke wheels. Sturdy tubular handles extend 34" out from body of cart. Legs are angle iron. All welded construction. Finished in air dry enamel. Weight approximately 130 lbs.

Square Trunnion Box and Trunnion Box Truck

Used for transporting work in process between operations or for hauling stock to storage; will handle all types of material including hot parts or liquids. Square-shaped boxes stack easier and save considerable floor space when compared with the commonly used round box. One truck serves any number of boxes.

Boxes are made of 12-gauge steel plate, with steel plate reinforcing at trunnion. All welded construction and water tight. Measure 18" by 18" by 24" high. Top edge formed for reinforcement. Weight 80 lbs.

Trunnion box truck is built of heavy bar stock, well reinforced, tubular handles, welded construction. Two 10" x 2½" roller bearing, metal wheels. Weight 100 lbs. Box and truck air dry enamel finish.

Operator moves trunnion truck to where forked uprights engage box trunnions, then a slight push down on truck handles picks box 3" off floor for easy wheeling. May also be used with overhead hoist.

Trunnion Box—**Item B-290**.....**$13.85** each
(Minimum order ten boxes)

Trunnion Box Truck—**Item B-268**.....**$37.50** each

Barrel and Box Skid—All Steel

All steel—welded construction—sturdily built—light weight—easy to handle.

Skid measures 14" wide overall. Will stand up under the heaviest barrel or box. Finished in air dry enamel.

Item B-470-8.....**$22.00**
is 8 ft. long, weighs 45 lbs.

Item B-470-10.....**$27.50**
is 10 ft. long, weighs 50 lbs.

If longer skids are desired, specify length and add $2.75 to each foot length over the 10 ft. length and price here quoted.

When Ordering always give "Item" number; this will help prevent error. All prices are f.o.b. Detroit.

Designers and Builders of all types of Trucks, Skids, Pallets, Platforms, Racks, Boxes, Bins, Tables, for Pick-up, Loading, Moving, Shipping, Dumping and Storage.

11

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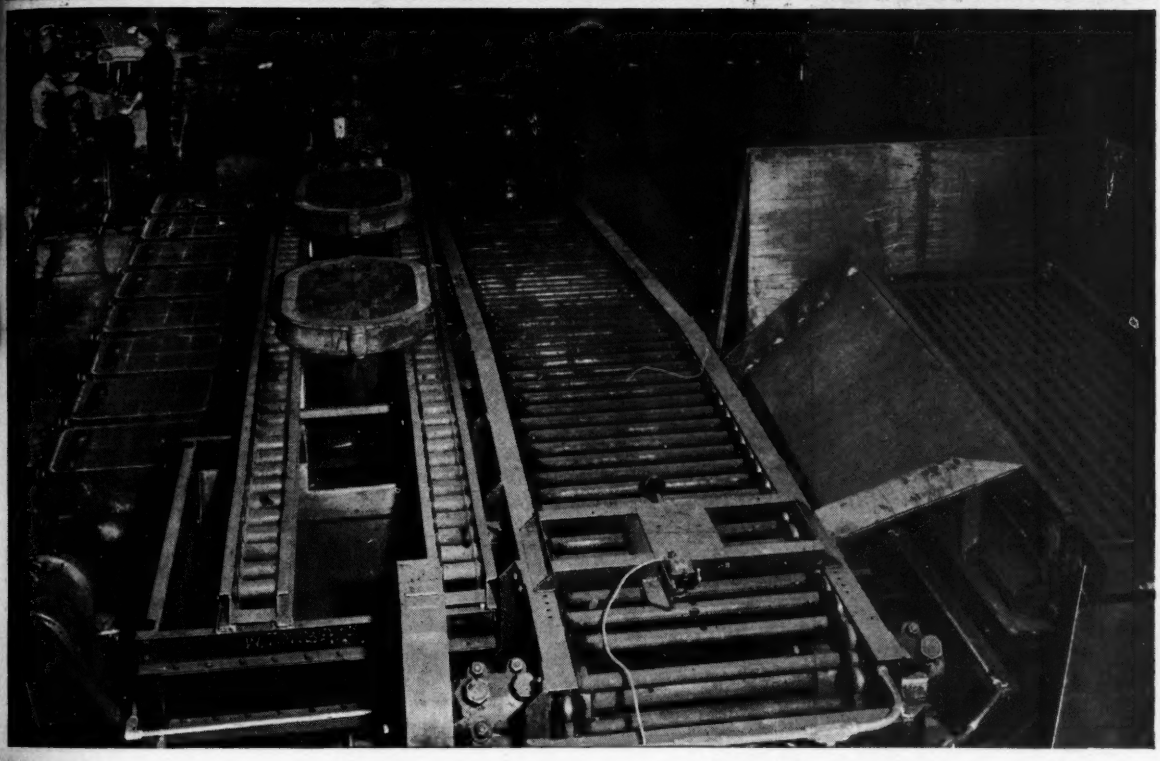
Mathews

CHAIN CONVEYERS

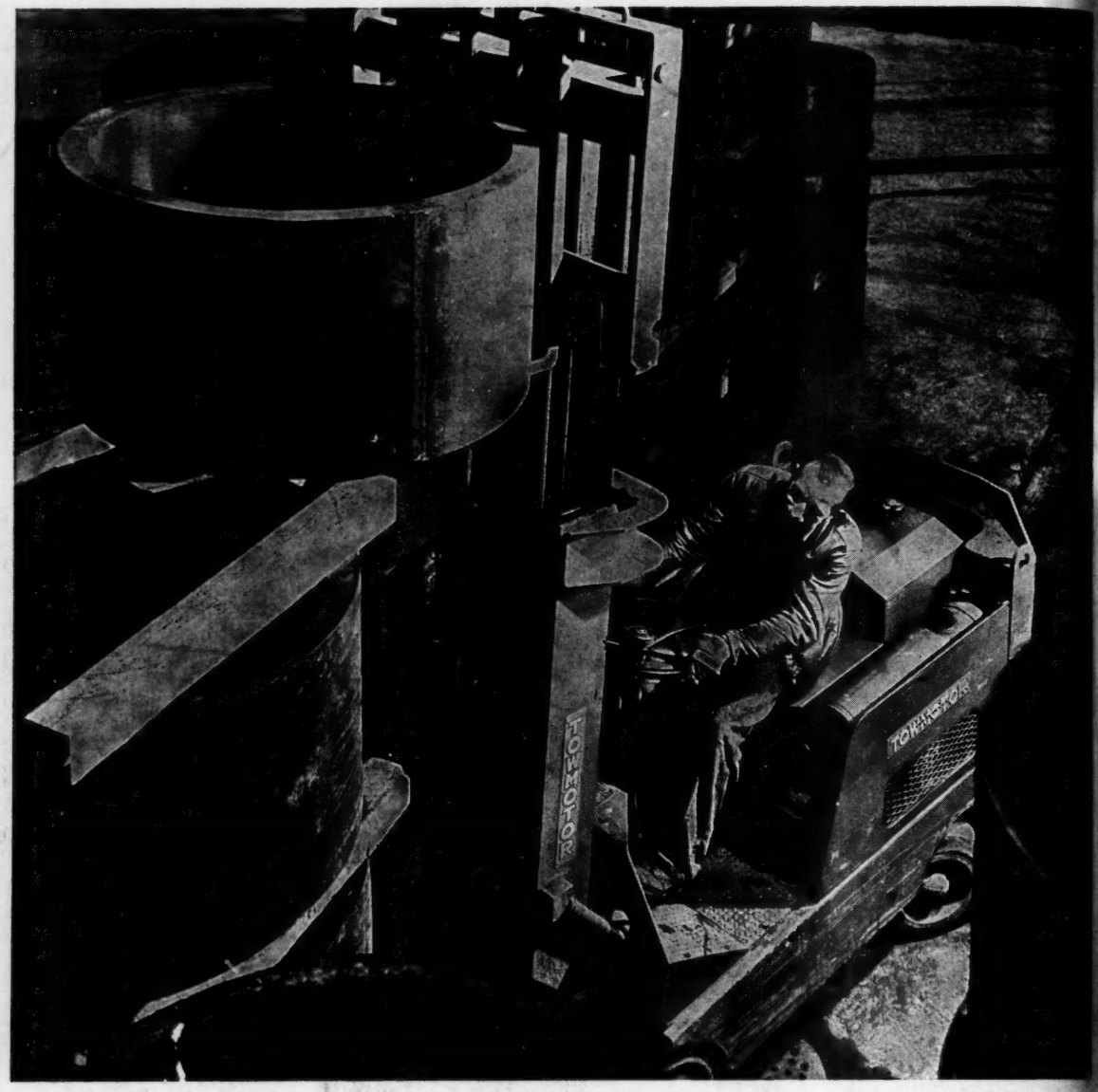
Engineered to serve Production



For heavy-duty work, such as illustrated above, where power conveyers are required, the pallet type Chain Conveyer is one of the most practical. It is capable of handling very heavy loads at carefully controlled speeds. The many different types of pallets available add to the flexibility of conveyers of this type. They can be of steel or wood, and can be spaced at various intervals in the chain, or can be interlocking. There is a Mathews Engineer operating in your vicinity. Ask him about Mathews Chain Conveyers, and the many other types of Mathews Foundry Conveyers which have been engineered to serve production

Mathews Conveyer Company

ELLWOOD CITY, PENNSYLVANIA



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Turning to Towmotor, Reliance devised an entirely new method of storing and handling raw materials. Using an outdoor storage area, Towmotor stores and stacks all raw materials, has increased storage space 300%. Even huge, cumbersome 1500-lb. frame rings are easily stacked five high by Towmotor. The additional storage space provided makes it possible to purchase raw materials in mill lots, effecting considerable savings in purchase price and assuring an ample supply of materials. The valuable inside space formerly needed for storage is now devoted to productive machinery.

For every handling problem there is an engineered solution . . . a solution based upon Towmotor experience and know-how gained in solving handling problems in every industry. Send for your copy of the Towmotor Lift Truck ANALYSIS GUIDE today.

Towmotor Corporation, Div. 12, 1226 East 152nd St., Cleveland 10, Ohio.

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